THE ORCHARD AND FRUIT GARDEN

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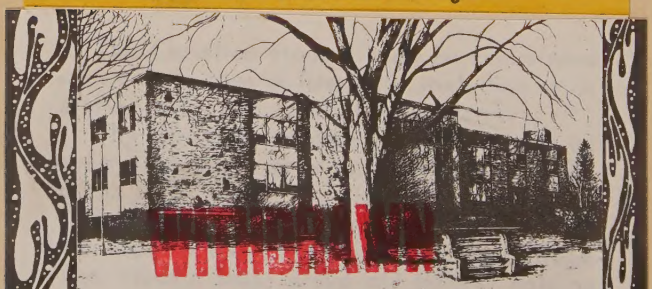

WITHDRAWN

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THE ORCHARD & FRUIT GARDEN

IN BLOSSOM THE CHERRY TREE IS IDEAL

THE ORCHARD AND FRUIT GARDEN

By

E. P. POWELL

Author of "The Country Home," "Windbreaks and Hedges"

ILLUSTRATED

DOUBLEDAY, PAGE & COMPANY

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1914

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THIS WORK IS DEDICATED TO

Charles Darwin, Charles Downing and Luther Burbank

To whom Pomology owes about equal honour — to the first for breaking down the "impassible" barriers between species, and pointing the road of progressive achievement; to the second for untiring assiduity in collecting and classifying American fruits — a Herculean task; to the third for leading the ever-increasing host of plant breeders and fruit creators. They have opened the way into a new world, as truly as Columbus; a world of wonders and treasures to be measured only by the enterprises of future mankind.

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INTRODUCTION

INTRODUCTION

EVERY land owner should be a fruit grower. The symbol of civilization has all along been the orchard, and the evolution of better fruits has been a distinctive feature of the highest progress made by man during the last two centuries. Yet the writer remembers only half a century ago when boys for ten miles around, visited his father's orchard at night, so few were the apple trees in Central New York. In the long rows of cherry trees that surrounded the homestead lot, young collegians were as troublesome as robins.

In 1845, Charles Downing published "Fruit and Fruit Trees of America"; a monumental work, still of considerable use for reference, and only made less useful by the very progress incited by itself. The Downings are worthy of as much honour from our country as the most heroic soldiers and most devoted inventors. Quietly they worked a revolution — a revolution in our homes and our comforts. The full result of their work, and the work of their disciples, did not appear until near the close of the century; when we found, not only the land covered with orchards, but the inhabitants of cities tiding outward, that they too, might secure homes, each one under his own vine and pear tree.

Kit Carsons are gone forever; Campbells, Meehans, Barrys, Warders, Munsons, and Burbanks have taken their places. Vast

forests and prairies were broken up into ranges and ranches, which filled the unknown West of our boyhood; and now these are quietly dissolving into small homesteads. After the wilderness was traversed, and opened, came a day of army posts. In the canyons and mountain retreats, that were then inaccessible, hotels now welcome us as tourists. To-morrow nestling homes, surrounded by oranges and olives, or by apples and grapes, will cover the continent.

Still there is a vast deal to do. Evolution falls more and more under the control of intelligent human agency. Varieties are multiplying; new fruits must be studied and tested, until their relative and local values are better understood. The elimination of second class or surpassed sorts is as constant as the addition of improved. A new fruit book has become a necessity every ten years; but no fruit book of an exhaustive sort will ever again be written — the field is too large, and progress too rapid. Almost every year some one sends out a creation of new grapes, of plums, of cherries or of berries. Some of the most notable names in American history are perpetuated, not in political strife, but in the more glorious struggle to aid human evolution, by evolution in the orchard and fruit garden. Nearly every county in the United States can show at least one experimental farm orchard; many of them can show a large number.

The reports of the Secretary of Agriculture have grown rich with the announcements of new cereals and new fruits, created under national supervision, or wisely collected from foreign countries; while our State Stations rival the National by investigations involving the utmost reach of science, in collaboration with nature.

The object of this volume is not to furnish an exhaustive treatise on orchard fruits and fruit gardens, but to furnish a thoroughly

reliable book, for those who are establishing their homes on the improved basis of intensive culture; and especially to assist those who are escaping from the confinement of city life to the freedom and luxuries of suburban homes.

PART FIRST

THE ORCHARD

CHAPTER ONE

THE APPLE TREE

THE apple is king of fruits by common consent. It cannot be grown all over the world, but all over the world it is held to be the most wonderful and useful product of the orchard. Our American or native apple is still nothing more than a wild crab; it is not the origin of what we have in our orchards. The improved Eastern stock was brought over by the earliest colonists, and soon became at home in New England, Virginia, and the Carolinas. The Indians got hold of the seed, and planted orchards of their own — seedlings of course from seedlings. They were at least better than the native crabs, to which the aborigines had previously been confined. The older orchards of the colonists were also from seed, and although they had a family likeness to English progenitors, they were variable in quality. As a rule the seedling apple, from most varieties, goes back toward wild ancestry. I now own the first orchard planted in New York State, by New Englanders on their way westward. Trees are still standing that were planted in 1791 and are bearing heavy crops — but are mostly grafted. One seedling apple out of a hundred, may prove worthy of propagation; more likely one out of a thousand. Yet in this way our list has come, through several centuries, to include a number of varieties, like Spitzenburg, Rhode Island Greening, and Newtown Pippin.

The Apple Belt, as it is called, is very nearly coincident with the Corn Belt; neither of them following exact parallels, but extending fully across the United States; while expanding into Canada on the north, and to the south having spurs that reach into Texas and Mexico. The State of Washington on the Pacific is notable for fine fruit; so also Arkansas in the Southwest. The Ozark Mountains of Missouri have become famous for "big red apples." That section is developing a race of apple enthusiasts, who find no pleasure greater than that of collecting choice varieties, and multiplying them for the advantage of the world. This fruit belt may still be widened, by careful selection of extra hardy sorts, for the north; and varieties that will endure winter-thawing and summer heats for the south.

For the propagation of the better sorts of apples, different methods of grafting were devised hundreds of years ago. The practice was known among the Romans, it was adopted especially by the Flemish and English peoples; and our New England fathers soon fell into the habit of improving their seedlings with grafts from England and France. It is a wonderful provision of nature that permits the new and inserted growth of a tree to retain its aristocratic breeding, and not fall back to the grade of the stock on which the graft is set. Little bundles of cuttings came over from England, carefully wrapped in wet moss, and reaching New England in March or April, were deftly inserted in wild trees. Very soon New England had her own cions, which were distributed with generosity, until apple orchards, containing high-grade fruit, were close on the heels of pioneers. From Connecticut cions were carried westward into Central New York, and northward to Vermont. By 1825 the Seeknofurther, the Spitzenburg, the Greening and the Russets

were found as far west as Ohio; and in 1850 Michigan was famous for it Roxburys and its Bellflowers.

This struggle to improve nature and aid in the evolution of finer fruits is supplemented, or ought to be, by the equally important enterprise of selecting and preserving. Many excellent apples have sprung up around the byways and hedges, and been only locally known, until they have been allowed to perish. Downing began the great work of hunting up such stock, and spent many years in travelling, studying, and corresponding, until he could give us his immortal fruit book. Just how far the tendency to revert to the wild will be overcome, and the fixedness, characteristic of the Fameuse family, be established, I cannot say. It seems very probable however, that we shall in time secure a very general stability in apple families, so that seedlings will closely reproduce the better qualities of the parent. Among the productions of recent date we have the old Sweet Bough reproduced as a sour apple; and Mr. Burbank gives us the autumn Gravenstein as a late winter apple; having the qualities of the parent, even somewhat improved. The Fameuse family has now members that ripen in August, others in October, while still others are late-keeping winter sorts. This drift in evolution is extremely interesting; and the time may come when grafting will be largely superseded by seedling growing.

The apple orchard as a rule, is the most shamefully neglected part of the farm. This arises from a general impression that the apple tree is particularly capable of taking care of itself. All that the farmer has to do is to buy trees of an agent, thrust them into the soil, and leave them to grow up and produce. They are left without trimming, if they are not browsed by cattle. Old orchards are dying out everywhere because left to develop suckers, that

devitalize the old limbs, till they are brittle and fruitless. The consequence of such neglect is the rapid deterioration of fruit, and the early decay and death of the orchard. It is difficult to find, even where apple orchards are most plentiful, well-trimmed and cared-for trees. In reality no fruit tree needs more careful oversight, nourishment, and study than the apple. The pear tree is much better able to attend to itself. The wood is generally tougher, and the tendency to suckering, in mature trees, is not so serious. You will find that an apple orchard is a worthless piece of property, unless it can have the brains of its owner to supplement nature.

The apple tree adapts itself to a great variety of soils; but like nearly all fruit trees, it prefers a clay or a composite soil. Wherever you can grow corn, you can probably grow apples. It is desirable that the orchard face the east or the west, in preference to the south. In fact with this fruit, as we shall find with the cherry and plum, there is no more common danger to the tree than thawing and freezing alternately in the winter. Some intelligent orchardists prefer a northern exposure; my own preference is for the eastern slope. A few varieties must be considered as exceptional, in their choice of sandy soil, and considerable heat that would be objectionable to our older pippins and greenings. The Golden Pippin or Grimes' Golden and Jonathan, are notable instances of apples that thrive best in the somewhat sandy soil of Southern Ohio. Clay lands delay growth, but they make harder wood. I do not know of any more thrifty orchards than those that have been planted on lands that have been recently cleared of timber. Such soil contains all necessary plant food, and as a result the trees grow to nearly twice the size of those grown on old and long-tilled soil.

Before planting an orchard the land should be thoroughly drained. If it be a naturally wet and retentive soil, put in a thorough system of tile or stone drains. The planting may be done with about equal success in spring or in fall. If the trees are set in the fall they must, however, be slightly mounded up, and carefully staked, so that they shall not be twisted about by the wind. It is equally important that the work be done when the soil is not sticky. Setting in mud is one of the most reprehensible habits. An orchard set in this manner is very slow to start, if it ever makes any growth at all. The fine feeding roots are encased in a sort of plaster, from which they find great difficulty in escaping. Spring planting is probably advisable for most home-makers. The old-time directions were astoundingly elaborate, requiring holes three or four times as large as the roots, and a preparation of soil with fertilizers. If your orchard ground is in proper tilth, and clean, and the soil is in a friable condition, you may set your trees with great rapidity — using no fertilizers whatever. In wind-swept sections spring-planted trees should be staked as carefully as those set in the fall. You will often see whole orchards leaning sharply with the wind currents — so that the trees stand at an angle of fifty or sixty degrees. They should have been staked when planted, and by systematic pruning prevented from leaning.

The most important rules in orchard trimming, beyond that of keeping out suckers, is to let the trees pretty well alone. More damage is done with the saw in an apple orchard than by wind and hail combined. Some growers have a trimming disease, which comes on annually, and requires a vigorous use of saw and hatchet. Of course the time will come in all orchards when large limbs will have to be removed. When this is done, saw carefully close to the

tree, and paint over the wound. It is very important, when cutting out suckers and small limbs, that you cut very closely into the bark of the tree. All around the base of these shoots are dormant buds, which if not excinded with your knife, will start into growth, and give you half a dozen shoots where you had one. The professional trimmer can rarely be trusted in this matter. Cut smooth, cut close, and cut prompt. This superfluous wood drains the life of the tree. It must not be tolerated, even for a few weeks, if you expect vital, long-lived, and profitable orchard trees. My plan is to set low-headed trees, and gradually raise the heads so that the orchard can be plowed. Bear in mind, however, that different varieties form very different shaped heads. The Northern Spy lifts itself very erectly, until twenty or twenty-five years old; after which it spreads and droops. On the other hand the Spitzenburg sprawls its limbs from the outset, and will get in the way quite easily. The Rhode Island Greening is another tree that sends out nearly horizontal limbs. The Golden Russet makes an ideal orchard tree; lifting its limbs well out of the way of the plowman. So you see that some varieties, when set, must be limbed higher than others.

There is considerable difference of opinion as to the proper distance apart for planting apple trees. Some of our pomologists insist that if we set out trees twenty feet apart, or twenty-five, they will have done their best work by the time that their limbs interfere. This is probably true; for trees set so close as to densely shade the ground, and deprive the lower limbs of sunshine, will be beyond maturity when they are twenty-five years old; and will have become full of dead limbs by thirty, My advice is to plant your orchard with the expectation that the trees, with proper culture and

feeding, will be as long-lived as those grown by our fathers. A properly cared-for orchard should be thrifty and profitable when it is eighty to one hundred years of age. It may be as well to add at this point that the notion has been entirely disproved that varieties reach a limit of age, after which they deteriorate both in tree and in fruit. No apple is at present furnishing better crops than the Spitzenburg, which some forty years ago was said to have reached its old age limit. A great deal of fine theorizing was wasted on this subject. I do not know one variety of apple that does not give as good fruit as it gave seventy-five years ago.

Feeding an orchard is just as important as feeding animals. We may assume, as a general rule, that our soil has lost some of the elements essential to the most profitable orchard growing. Well-rotted barnyard manure constitutes one of the best orchard fertilizers, but this is not the chief purpose of applying this sort of manure. Its main end is to furnish a good supply of humus to the soil. It is far better, however, if barnyard manure be mixed with coal ashes, wood ashes, and other ingredients, such as a farmer can collect for a compost pile. If well decomposed before applied, there is much less waste into the atmosphere. Wood ashes, applied quite freely, yields the largest amount of direct food that we can furnish the apple tree. Three hundred pounds of muriate of potash may be applied to the acre. Nitrogen will be added to the soil quite freely from the proper kinds of cover-crops. For potash and phosphoric acid commercial fertilizers may be needed.

By cover crop we mean that, after the orchard has been cultivated until August, alfalfa or clover or cowpeas should be sowed, to remain through the winter — to cover the roots — and then be

plowed under in the spring. In our older states this custom is found to be quite essential, not only to protect the roots, but to add decaying vegetable matter to the soil. The leguminous plants and clovers have also the power to take nitrogen from the air and add it to the soil. Crimson clover is used in the Southern States, and cowpeas; while in the Northern States there is a more general use of red clover and alfalfa. The distinguished pomologist, Dr. Warder, insisted that a healthy tree not needing artificial food, should make terminal growth of at least one foot each season. This may be true of young trees, but it is not true in an old orchard.

Both the apple tree and the apple itself have a host of friends — or enemies — as you please to call them. The most important, because the most universal, is the codlin moth. The larva of this moth hatches in the blossom end of the fruit; and eats its way, either to the entire destruction or the mutilation, of every specimen assailed. The moth is active during the blossoming season, and continues its mischief until the apple turns over, in its growth. The remedy now generally adopted is spraying with arsenical poisons. After considerable investigation and experiment, I have settled down to this general system of spraying. I apply before the buds swell, or as they swell, a very liberal application of Bordeaux mixture. To this may be added Paris green, or other arsenical poisons, if you choose. The object of this first spraying is mainly to prevent the development of fungoid diseases. Two to four more sprayings are added later, and about ten days apart.

Another very destructive enemy of the orchard is the round-headed borer. You will discover his presence by finding sawdust lying at the base of your trees. This is the fiber that has been gnawed by the larvæ while burrowing. When mature this larva is about

three-quarters of an inch in length — a fleshy, light-yellow creature, with a head nearly black. The proper remedy is to run a flexible wire up his track, until he is crushed. Use a knife freely about the opening. After your trees are thoroughly cleaned, apply coal ashes freely. About small trees use a peck of ashes, and about old trees pile a bushel or more. This is the true remedy for all borers that work around the base or crown of trees. A smaller beetle, known as the flat-headed apple-tree borer is very common, but generally confines his work to trees that are dying or badly diseased. I discover the work of this beetle more frequently in my peach and plum trees than in my apple trees. The larvæ should be cut out, and the sore spots painted over.

A good deal of complaint has been made recently of the ribbed cocoon maker. This is a dark greenish caterpillar, about one fourth of an inch long, generally noticed as hanging suspended from the leaves with silken threads. The cocoons sometimes completely cover the surface of the twigs, so that at a distance there is the appearance of whitewash. The caterpillars skeletonize the leaves, until they grow brown and turn up. The work is generally done in August and September. This pest is not very serious, because its depredations are confined to small areas. The remedy is a very strong kerosene emulsion, or solution of whale oil soap. An application of the lime salt and sulphur wash has proved effective.

The ordinary "apple tree worm," or tent caterpillar makes its appearance sporadically. It is not easily distinguished from the forest worm, except that the latter seldom makes a tent — nor does the forest worm appear, in any numbers, oftener than once in thirty or forty years. The nests of the tent caterpillar should be destroyed very early in the spring, with torches, charged with

kerosene. During the winter months, search for and destroy the eggs, which are glued to the ends of twigs. This pest can be easily kept under — by prompt and thorough work. It is soon followed by parasitic enemies, which greatly aid us in its destruction. Two or three years in succession is generally the limit of its local appearance.

There are two species of canker worm which greatly trouble the orchardist, at times. The only difference that the fruit grower need to consider is that one hatches out in the fall of the year, while the other hatches into the adult form in the spring. When the weather is warm enough to start foliage on the trees, the eggs hatch into little dark coloured worms, which move in a looping fashion. They spin webs wherever they go, and when the limbs are jarred they drop a foot or more, and then climb back again. You may spray the larvæ with an arsenical poison, made rather stronger than you would use for the codlin moth.

The apple aphis or plant louse is sometimes one of our very worst orchard troubles; as it comes in such astonishing numbers, and works with such rapidity. The leaves begin to curl up in a way to protect the insects, while they are sucking the life from the tree. Fortunately this pest does not appear with any regularity, or frequently. The eggs are deposited in October and November, on the young shoots of the trees. They hatch about the last of April, and multiply with enormous rapidity. It is fortunate for us that the appearance of the aphis, in all its varieties, is immediately followed by the development of insects which feed upon them. Our first step is to see to it that such parasites are not disturbed. Especially helpful, is the white-faced hornet, which builds its paper nests about our trees and houses. The best artificial

remedy that we have yet discovered is strong kerosene emulsion, supplemented by the lime and sulphur mixture. Quassia and whale oil soap solution are said by some to give the best results.

Apple scab is a fungoid disease to which apple trees are subject in very different degrees. Some varieties are so subject to the scab that I find it desirable to keep them grafted in the tops of other varieties. Both fruit and tree are affected; for this reason Bordeaux mixture must be used, and the spraying done very effectively. The Oregon Experiment Station reports, for second spraying, four pounds of lime and six of blue vitriol to fifty gallons of water. The first spraying for scab should be given just as the buds break; the second when part of the blossoms have fallen, and a third when the apples are the size of marbles. It is urged by experts that scabby leaves should be plowed under or burned.

Crown gall is becoming one of the most serious troubles in fruit gardens and orchards. The galls are irregular growths of tissue, on the roots, just below the surface of the ground, or around the crown of the tree. They increase rapidly in size, and disturb the process of nutrition. Galls are by no means confined to apple trees, but are found on our garden berries, on the apricot, almond, cherry, plum, peach, and English walnut. It seems to be a disease that can be readily carried from one tree, or one variety of trees, to another. Wherever it develops the berry plant will be obliterated, and the fruit trees, although lingering along for a number of years, will be devitalized and worthless. The remedy is in the first place preventive. The trees that we purchase must come from nurseries that have been inspected. The New York Experiment Station reports that crown gall is not uncommon in stock, arriving from outside the state, or that found in home nurseries. Some of the states

are very rigidly inspecting, to prevent any farther spread of the dreaded disease. When it appears, dig up affected roots and burn them as soon as possible. Among the remedies tested are ammonia water, which killed many of the trees; copperas, which caused no injury to the trees, but was not entirely effective with the galls; sulphur, salt, gas-tar — all of which proved ineffective; so that in fact we remain without any other sure remedy than that of prevention.

It is important in order to secure an annual supply of apples on a small homestead, that we have trees that start into bearing on different years. This habit once established will be kept up, in all probability. In this way I get two trees of Astrachans in bearing one year, and two other trees the next, and so on for alternate years. A Monroe County grower reports a row of Snow apples that bears alternate years on opposite sides. This habit has come from some accidental conditions of freezing in winter, or a damp blossoming time, preventing the pollenation of the fruit on one side; and is retained.

Some of my readers will certainly come into possession of an old decrepit orchard, and wish to know how to improve it. If the trees are very large, very old, and very haggard, it will be a problem whether they had not better be cut down, and a new orchard planted. This will be a disagreeable conclusion, and should not be reached too promptly. An old apple tree is a very homeful affair. If possible save a few of them. Remember that old associations cluster about an orchard. If you conclude to renovate them, first of all cut out the dead wood and the suckers. In nine cases out of ten you will find that the ruin has been wrought by allowing a growth of young shoots all over the limbs and the body of the tree.

These are called suckers, because they have sucked the vitality out of the older limbs. When you have removed them, your trees will look somewhat poky, and bare of foliage. You will have left a few of the very largest and best located suckers, to make new limbs. Your next step will be to plow and fertilize the trees. They are probably half-starved, and have been living on short commons for twenty or thirty years. Keep the ground in good tilth until July or August; and then prepare to sow a crop of clover or alfalfa. This must be allowed to remain as a cover crop until the next spring; and then it must be plowed under. It will furnish a rich feast for the trees; but to it must be added annually a good dressing of compost or barnyard manure. Now examine these old trees as to what they are yielding. If they are giving you only cider apples, or some inferior stock, study where you can graft in the best sorts. Do not let a professional grafter get into your trees, to work his own will. He will surely ruin them. It is his interest to insert as many cions as possible; it is your interest to have only those which will improve both trees and fruit. Do not allow any very large limbs to be cut away. Gradually you will find your old trees taking a better shape, and a better colour. The annual growth will increase, and the bearing will be as satisfactory as on young trees. I have seen old trunks, thoroughly decayed at the heart, and with apparently very little life left, renovated so as to be beautiful and profitable.

The renovation of younger orchards, which have been badly neglected, must follow very nearly the same line of work. Remove the dead wood and the suckers, and clean the bark of lurking places for insects. Feed the trees well, and, as you find it advisable, graft in improved varieties. This trimming must be an annual

affair; that is it must keep out superfluous growth; and the feeding of the trees must also be annual. If the trees have been set too close, so that the limbs interlock, you must cut out enough wood to let in sunshine. This is an absolute necessity in growing good fruit. The best varieties, growing in the shade, not only lack colour but flavour. It may be necessary to cut out whole trees; but do not engage in this business without careful thought and study. There is frequently a great deal of damage done by letting in too much sunshine, where the bark of trees has grown for many years in shade.

The old-fashioned farmhouse often stood in an orchard. The apple was recognized not only as an important food, but the tree was held to be most excellent for shade. There is a certain class of trees that may be described as homeful or homelike. Among these the apple stands eminent. The rural home needs about it rustic trees, with informality; and this is just what you get from such trees as the apple and the butternut. The association with such trees in childhood goes with one through life. There is really no reason why our lawn trees should not, at least in part, be made up of fruit trees. Let them stand in groups or groves, with walks and drives convenient to the house. A house planted like this has a homeful atmosphere, that will keep the young folks at home, and establish attachments that will not be easily broken.

CHAPTER TWO

THE APPLE—VARIETIES

IN making out a list of apples that shall be useful to home-makers, I shall not undertake the hopeless task of classifying and describing all the apples that grow in the United States. Nor shall I undertake to furnish descriptions so complete that they will settle the identity of any variety that may be in question. This work must be left hereafter to manuals. My object will be to furnish rather full lists of the better sorts; such lists as will be most helpful to those who are establishing country homes, either on a small or a large scale.

A good list of apples for the general apple belt should include among summer varieties:

Benoni — Not as well known as it should be, being one of the best in quality, as well as a good market apple.

Crimson Beauty — A Fameuse seedling, and a remarkably beautiful and promising apple. The fruit is large, yellowish white, spread over with crimson red; fine grained and delicious — ripening one week earlier than Yellow Transparent.

Early Melon — A splendid late summer apple, both for eating and cooking. Large, nearly white, and striped over with red and yellow — very tart.

Early Strawberry — A medium-sized apple; pale yellow covered

with deep red. The quality is of the best, tender, and almost melting.

Fanny—A large rich crimson apple, as good in quality as it is beautiful to look at. The tree is vigorous and very productive, with a spreading style of growth.

Julian—A North Carolina apple, of very good quality; ripening in July and August. The fruit is medium in size; light yellow, mottled with red.

Liefland Raspberry—One of the most beautiful of all apples, and in quality exceeds any one of the very early sorts.

Maxson's Early—A new seedling of the Sweet Bough, which it resembles in all ways, except that it is acid instead of sweet. It is one of the best summer cooking apples.

Oldenburg, or Duchess of Oldenburg—An apple that has come into great favour because of its rich acidity; and for the great hardiness and productiveness of the tree.

Primate—One of the very best early apples, of medium size, pale yellow with a blush cheek. It is fine-grained and juicy. The tree is a good grower and productive.

Red Astrachan—A large, deep red apple, and very handsome. The quality is very acid for dessert, but is of the highest rank for cooking. The tree is a good grower, compact and uniform in shape, and a very heavy bearer.

Sops of Wine—An old sort, ripening in July or early August. The quality is juicy, mild, and subacid.

Summer King—An old apple, but not very well known in our Eastern markets. It is very beautiful, and of fair quality. It is also an excellent keeper.

Summer Queen—A very large apple, whitish yellow overlaid

with dull red. The tree is very prolific, and the apple, while profitable as grown in the Western States, is better for cooking than for eating from hand.

Sweet Bough—A very large and pale yellow apple — most delicious, when the fruit is well ripened. Unfortunately it is badly interfered with by the trypeta fly; and is also likely to drop from the tree before ripe.

Williams' Favourite—A large red apple of splendid qualities, more popular in Massachusetts than elsewhere.

Yellow Transparent—This Russian apple is delightful for dessert as it is good for cooking. It is large, with a pale yellow skin, almost transparent. The tree is a very upright grower, and good producer. It ripens just before the Astrachan, and should be in the smallest grounds.

For Autumn bearing the list should include at least the following sorts:

Alexander—A large and handsome red apple; good for market, but of only second-rate quality for dessert.

Chenango—A large and handsome apple, specially valued for its appearance in market — quality only second rate.

Fall Wine—A very delicious apple; almost sweet; tender aromatic. The tree is of slender growth, and a moderate bearer.

Fameuse—Ordinarily called the Snow apple; it is notable for its rich crimson colour and pure white flesh. It is tender and delicious in quality. The tree is one of the most vigorous in growth, and bears enormous crops.

Fulton—A Western apple; large, light yellow with crimson blush. This is another of the mild, aromatic fruits; almost sweet.

Gideon — A Minnesota apple, of fine quality, large and attractive — yellow with a bronze blush. It ripens in October and November. Tree very hardy.

Gravenstein — One of the finest apples now grown. It is large; yellow, overlaid with red; very solid in flesh; and equally good for dessert or cooking.

Haas, or Fall Queen — A large yellow apple, nearly covered with red; in quality juicy and tender — very popular in the Southwest.

Hurlbut — Subacid, yellow with red stripes, flesh white and quality very good. The tree bears early and regularly.

Jersey Sweet — A thoroughly good baking apple, for September.

Longfield — A Russian apple, of fine quality. The flesh is very white, tender and juicy. The tree is of a spreading growth, almost weeping.

Maiden's Blush — One of the most beautiful and most productive fall varieties. The tree is very spreading in growth, and an annual bearer. The fruit must be promptly picked, or it will fall from the branches.

Oliver — An Arkansas apple, very popular in the Southwest. The quality is fine, and the appearance very handsome.

Plumb Cider — A Wisconsin apple of very fine quality. The fruit is medium in size; fine-grained, juicy, and rather acid. The tree is very vigorous, as well as an early bearer, and very productive.

Porter — An excellent apple, when grown on the tops of old trees; but its quality is generally only second rate when grown on its own stock.

St. Lawrence — A large apple, streaked with red and yellow. The tree is very hardy, and a free grower.

Strawberry, or Sherwood's Favourite—Of the most delicious quality, deep red, and yellow fleshed. It needs, however, careful thinning, and the trees must be well fed, and well trimmed, in order to secure perfect fruit.

Stump—Of medium size, skin yellow striped with red, and to be ranked very high in quality — tender, juicy, and sprightly.

Wealthy—This apple originated in Minnesota, and is notable for hardiness of tree and fruit bud. It is a free grower, and very productive of apples of good quality, vinous, juicy, and subacid.

The following list of winter varieties is intended to include the more important for the general apple belt.

Akin — A very handsome red apple, of good quality — perhaps of the best; and a good keeper.

Apple of Commerce — The fruit of this tree is not of the highest quality, but is a very late keeper. It is winning considerable attention in the Southwest.

Arkansas Black — A variety that has a good deal of favour in the Southwest; but the fruit scabs badly. It is deep red, and quality very high.

Arnold—A seedling of Northern Spy, crossed with Spitzenburg. The fruit is of medium size; yellow colour and yellow flesh — in use all winter. A fine apple.

Bailey Sweet — Large and good — very fine-grained, and in use till January. The tree is vigorous and productive.

Baldwin—Probably no apple has secured so general popularity. When well grown, on trees well open to the sun, it is bright red and very rich. Many of those placed on the market are grown too close, and are unfit for use.

Banana — A very good apple, and a good keeper. There seem to be two varieties going under this name — one an early and the other a long-keeping winter apple.

Belle Bonne — An old Connecticut apple, of exceedingly good sweet flavour, and keeping till June. Tree is very hardy, tough, and bears large crops. The apple is of a clear yellow, generally dotted, and slightly russety.

Belmont — In very high favour in Michigan, and some other sections, for its delicate flesh. It is a spreading tree, bearing heavy crops that ripen in November, and are in good eating until last of January.

Ben Davis — I should leave this out of the list, were it not so much pressed forward by many nurserymen. The apple is nearly worthless in quality; and in this section the tree is badly affected by scab.

Bismarck — A short stocky-growing tree, bearing good crops when very young; of little value in the North except for decorative purposes, and for growing in pots; recommended highly for hot climates.

Black Ben Davis, or Black Ben — Superb in colour, size, and keeping qualities, while in flavour it is totally unlike Ben Davis. It is a great commercial fruit.

Boiken — A new apple of fair size, yellow and a long keeper. It is a good apple for its season, which is April and May.

Canada Reinette — A winter apple, that can be ranked as first rate. Large, somewhat flattened in shape; surface greenish yellow, and the flesh white. It will keep until April.

Chicago — Experts pronounce the Chicago a remarkable ac-

quisition — as a long-keeping winter apple. The fruit is very large, a deep yellow almost entirely overlaid with red.

Cogswell — A Connecticut apple of excellent quality; yellow nearly covered with red; very fine-grained, tender, and subacid.

Colman — A new apple, said to be a cross of Jonathan with Northern Spy. The fruit is large, yellow striped with red; flesh white and quality extremely good. It originated in Iowa. Worthy of a place in small orchards.

Danchy's Sweet — This is one of the recently introduced fruits, of the very highest quality. I have not tasted a better sweet apple; large, tender, and aromatic — as well as very handsome.

Delicious — One of the highest-flavoured apples I have ever tasted, and as noble looking as it is high in quality — large yellow, deeply overlaid with red.

Dominie — Large, yellow striped with red, and of very good quality. The tree is a profuse bearer, and adapts itself to all soils.

Dudley Winter, or North Star — A new apple from Maine; yellow splashed with crimson; fine-grained and of very excellent promise; ripens early in the winter.

Fallawater — A very large and beautiful apple, and the quality is excellent. The tree is vigorous, bearing when young, and heavily. The apple is in use from November to March.

Golden Russet — A medium-sized yellowish russet, with very rich and juicy flesh. An excellent upright grower, and bears immense crops.

Grimes' Golden Pippin — A rich golden yellow, of medium size; best adapted to sandy soils, and to the southern line of apple growing; a great acquisition.

Hamburg — A seedling of Fameuse, originating in Minnesota. The fruit is large, nearly yellow, sometimes splashed with crimson; juicy, very good, and much like its parent. In use till February.

Hibernal — Another of the Russian apples, of considerable promise, especially for the Northwest; ripening in early winter.

Hoover — A South Carolina apple, of exceedingly good quality; medium in size; yellow splashed with red, and flesh yellow. Ripe in midwinter.

Hubbardston — A noble and very large apple, striped yellow and red, of finest flavour. The tree is a very handsome grower, and bears heavy crops. In use from November to May.

Huntsman — A Missouri apple of excellent quality; ripening from December to March. The fruit is large; surface a clear yellow, with a blush; and flesh yellow, spicy and subacid.

Ingram — This apple is popular in the Southwest; of good quality and a good keeper. The tree bears when very young, and, like all early-bearing trees it does not attain large size, and therefore makes what is known as a good "filler," that is a variety to grow between standard varieties, and occupy little room.

Jonathan — A seedling of the Spitzenburg, and a better grower, while retaining the best qualities of its parent. It is rich deep red when grown in the sun, and very attractive in market.

King, or Tompkin's County King — Has its chosen localities, where it will do its best. The wood is tender and brittle. It is best to graft it high on other stock. At its best it is well named.

Lady's Sweet — This very popular sweet apple is large, rich red, and exceedingly good at times. It needs good culture, open trees, and favourable seasons.

Mammoth Black Twig — A very large, dark red apple; while the tree is vigorous, productive, and very hardy.

Mann — Deep yellow, of medium size, juicy and subacid. The tree is a hardy, upright grower, and bears when quite young. The fruit keeps until May.

McIntosh Red — A large, roundish, yellow apple, almost covered with red. On the tree it is one of the most beautiful in the orchard. A seedling of Fameuse, it has the white flesh of its parent, keeps longer and has even a higher flavour.

Melon, or Norton's Melon — Medium sized; crisp, juicy, and aromatic. Pale yellow, marbled with bright red and splashed with crimson.

Mother — A large, rich red apple; flesh aromatic and tender. It is one of the best dessert apples.

Munson's Sweet — A New England apple of excellent quality; yellow with a blush; and in use from October to February.

Newtown Pippin — The same as the Albermarle Pippin, and one of the best apples for home or market. It keeps until June. It reaches its perfection in the Hudson Valley, and in few other localities.

Northern Spy — This apple has taken its place quite at the front of winter varieties over a very large territory. It is a large, striped apple; when grown in the sun, is covered with dark crimson. The flesh is rich, juicy, and refreshing. The tree is one of the most rapid growers, and very erect. Unless carefully directed, while young, the limbs will form a head from one point; and as a consequence will split down with a heavy weight of fruit. The tree will always need a good deal of trimming to keep the head open to the sun.

Northwestern Greening — A Greening of fine quality and of good size. The tree and fruit buds are very hardy.

Ontario — A large yellow apple, nearly covered with bright red; juicy, subacid and excellent.

Ortley — A New Jersey apple; large, pale yellow with a light blush; a very pleasant subacid; ripening in early winter.

Patten — A seedling of Oldenburg. This apple, like its parent, is very hardy in growth. The fruit is large; yellowish green with a blush; excellent for cooking and for the table. In use till the end of January.

Paragon — A very profitable apple for the South — highly recommended for California — originating in Tennessee. The fruit is large, yellow washed with red; flesh yellow; juicy and subacid — ripening in midwinter.

Peck's Pleasant — Large, pale yellow apple, with a reddish cheek. It somewhat resembles the Albermarle Pippin. Keeps well until May. Erect grower, and good bearer.

Pound Sweet — This grand apple must be picked in October; and although usable at once, may be kept nearly all winter. It is in greater market demand than ever.

Princess Louise — Another Fameuse seedling; light yellow, blushed with red. The quality is superb, if picked as soon as ripe; but deteriorates if left on the tree after October first.

Pryor Red — Popular in the South, where it keeps until late winter. The tree thrives best on deep rich soil, and in warm climates. The fruit is medium in size; greenish yellow covered with dull red; juicy, rich, and subacid.

Rawle's Genet — Very popular in the Southwest, because of its excellent keeping qualities. It is only of medium size, but is rich and juicy.

Ribston Pippin — An early winter apple, bearing annually superb crops of beautiful clean fruit — rather sharp acid for dessert, but excellent for cooking.

Rhode Island Greening — This old variety holds its own wonderfully, in spite of being green in colour. Well grown, on open trees, the flesh is rich yellow, and the skin has a golden undertone.

Roxbury Russet — Generally considered the best of the russets — very productive and a long keeper. In some sections the tree is very brittle. The fruit keeps until June.

Salome — A light yellow apple; ripening in October, but keeping till midwinter. The quality varies with the season — sometimes excellent.

Sconondo Sweet — A seedling in my own orchard. Fruit of the highest quality; but the tree scabs badly. Colour a rich yellow, sometimes with crimson cheek; in use from December until May.

Scott's Winter — Tree very hardy and vigorous, carrying heavy crops. Fruit crisp, and spicy. It is in prime in December and January, but keeps till May. Not appreciated at its full worth.

Senator — Another Western apple; of the very highest quality. The tree is a young, regular, and heavy bearer.

Shiawassie Beauty — Another seedling of Fameuse. Medium to large in size, and the trees are always loaded to their utmost capacity. The flesh is not as white as that of its parent, but is interlined with red. The skin is whitish nearly overlaid with rich red.

Shockley — A very popular apple in the South; only medium in size; pale yellow covered with bright red; of excellent quality and keeping all winter.

Smith's Cider — A large, handsome, red apple, very popular in the South and Southwest.

Smokehouse — A Pennsylvania apple of large size; surface yellow touched with red; quality rich and juicy and aromatic.

Spitzenburg — A large rich red apple; sometimes yellow overlaid with red. The flesh is rich and crisp; and is most highly esteemed for its cooking qualities. It should be grafted high on hardy stock. The growth is strong and rapid, but sprawly.

Springdale — A Southwestern apple that does well in the cotton belt. The tree is hardy, and the quality of the apple is very good.

Stayman's Winesap — A decided improvement on the old Winesap; with larger fruit and higher quality.

Steele's Red Winter: also called the Red Canada — Medium sized, red dotted with white; and considered a very superior fruit for dessert or market — one of the best keepers.

Stuart's Golden — Hardly medium size, but of the finest quality. It keeps admirably well and is in good eating from November until the last of May. The tree is not a good grower, in my experience.

Sutton Beauty — Fruit yellow striped with red. The flesh is white, tender, and juicy. The quality is very good. The tree is one of our finest growers, and very productive.

Swaar — This old English apple is of the largest size, lemon yellow, and of the very richest quality. It keeps its flavour until the very end of winter. The tree is not a good grower; should be grafted high on other stock.

Talman's Sweet — A pale yellow apple, with very firm flesh, and good for cooking. Market generally glutted. Tree is a good, upright grower, and bears enormous crops.

Vandevere — Medium sized, yellow, striped with red, of fine quality — flesh yellow. Tree succeeds best on a light soil.

Wagener — Somewhat resembles the Northern Spy, and is of excellent quality — subacid and firm-fleshed. The tree is an upright grower, and productive.

Walbridge — A very hardy and productive tree. The apple is of good quality, crisp and juicy, and a very late keeper.

Walter Pease — Another seedling of Fameuse; every way a remarkable apple. It begins to ripen in October, but will keep nearly all winter.

White Pearmain — An old eastern variety, that has come into popularity on the Pacific Coast. The fruit is medium to large in size; pale yellow with a bronze cheek; of splendid quality, spicy and subacid.

White Pippin — One of our cleanest and largest winter apples, of fine quality. The tree is a good bearer, and long lived.

Winterstein — One of Mr. Burbank's productions, and said to be a fruit of very high quality. It is a late winter apple, of the Gravenstein type. The flavour is rich and peculiar — a very promising new fruit.

Wismer's Dessert — A new claimant to favour, but unanimously pronounced a very high-grade fruit, having the flavour of a juicy pear. A long keeper; while the tree is hardy and an excellent grower.

Wolf River — A Wisconsin apple, and very hardy. The tree is a strong grower, bearing heavy crops, alternate years. The fruit is yellow, splashed with red; and the quality is tender and juicy.

Yahnke — A Minnesota fruit that has become popular. It will keep all winter; while the tree is very hardy, vigorous and productive. The fruit is large, yellow covered with crimson, and very good in quality.

Yellow Bellflower — A very large yellow apple, with crisp and juicy flesh — every way an excellent fruit where it is at its best. In the West the tree is a fine grower, and the fruit keeps until May.

York Imperial — One of the more recent introductions and winning its way everywhere. The flesh is firm and crisp; flavour subacid. The tree is very productive and vigorous.

To this list might be added many more really excellent apples. Some are dropped because superseded. New varieties are multiplying. Of these Banks is a promising bud sport from Gravenstein; Cox's Orange is an English variety taking well to our soil — best when top grafted. Victoria is another seedling of Fameuse, of splendid quality. Wellington and Walker are sure to take high rank.

The United States Department of Agriculture has undertaken to classify our best known apples, according to their adaptability to different sections of the country. I shall follow this classification only somewhat reducing the lists which are given us in Farmer's Bulletin, 113.

For the New England States, New York, Pennsylvania, Northern New Jersey, Northern Indiana and Michigan, the following varieties are suggested. Oldenburg; Early Strawberry; Maiden's Blush; Yellow Transparent; Primate; Red Astrachan; Longfield; Gravenstein; Fameuse; Bailey Sweet; Jacob's Sweet; Wagener ; Northern Spy; Spitzenburg; Baldwin; Rhode Island Greening; Stayman's Winesap; York Imperial; Porter; Mother; Shiawassie Beauty; Wealthy; Grimes' Golden; Jonathan; Seeknofurther; Red Canada; Dominie; King; Hubbardston; Roxbury Russet; Stark.

For South Carolina, Georgia, Alabama, Mississippi, Louisiana, and Texas are suggested Yellow Transparent; Red Astrachan; Summer Queen; Ben Davis; Shockley; Oldenburg; Winesap; and a few other varieties favourably known locally. For the Northwest are named Oldenburg; Tetofsky; Wolf River; Northwestern Greening; Yellow Transparent; Wealthy; Longfield; Fameuse, and several varieties of Russian origin. For a district not quite as far out of the apple belt are suggested Melon; Early Harvest; Primate; Gravenstein; Wolf River; Mother; McIntosh; Lady Sweet; with Rambo, Dyer, Lowell and Alexander.

The list recommended for California and Arizona includes Yellow Transparent; Red Astrachan; Oldenburg; Gravenstein; Porter; Maiden's Blush; Summer Strawberry; Red June; Fameuse; Grimes' Golden; Spitzenburg; King; Yellow Bellflower; Red Canada; Wagener; York Imperial; Wealthy; Alexander; Wolf River; Jonathan; Talman's Sweet; Hubbardston; White Pippin; Stark; Rome Beauty; Northern Spy; Winesap; Rhode Island Greening.

Delano Sanford recently reported for Iowa that his hardiest apples included Duchess, Hibernal, Charlamoff; but that these varieties, while perfectly hardy above ground, are less hardy below ground. Other varieties, like Whitney, Wolf River, Longfield, Antonovka, etc., prove hardy both above ground and below. He would mound up trees slightly in the fall; and in addition would graft Duchess and the like on hardier roots.

From Montana I get a report placing among the hardiest varieties and best for that climate, Delaware Red, Yellow Transparent, Red June, Duchess, Rome Beauty, Rhode Island Greening, McIntosh Red, Wealthy, Wagener, Gano, and McMahon White.

A bulletin from the New Hampshire Experiment Station recommends for summer use Williams, Red Astrachan, and Oldenburg. For autumn its selection would be Gravenstein, McIntosh, Wealthy, King, Hubbardston, and Grimes' Golden. Its list for winter includes Baldwin, Spy, Rhode Island Greening, Red Canada, Roxbury Russet, Ben Davis, Jonathan, Granite Beauty, and Bethel; adding for a sweet apple Tolman.

Washington has become notable for its fine apples. Large portions of that state and Idaho are of volcanic origin. The lava is covered with accumulations of ashes and soil, sometimes thousands of feet in depth. This soil is particularly adapted to fruit growing. Many of their best apples go to China, or to New York City, packed like oranges, in tissuepaper, and in boxes instead of barrels. Some of the largest growers confine themselves to Spitzenburg, Newtown Pippin, Stayman's Winesap, and a few more of the highest grade sorts. One of the leading growers writes that his tripod of success, in producing every year a good crop of fine quality fruit, is intensive cultivation, barnyard manure, and irrigation. These growers are very proud of their brand.

Judge Fred. Wellhouse reports from Kansas that he has planted sixteen hundred and thirty-five acres of apple trees. He succeeds best with Jonathan, Missouri Pippin, Ben Davis, Winesap, Gano, York Imperial, Maiden's Blush, and Cooper's Early. He is now beginning to drop the last two from his plantings. He wants an apple as hardy and productive as Ben Davis and as good in quality as Grimes' Golden. With me in New York State, Grimes' Golden is fully as productive as Ben Davis. It needs higher culture, and the bark sometimes winter-kills.

The fact is that very little help can be given to those who

are intending to plant apples, except in a general way, to designate a few varieties that are sure to be adapted to the locality, and a few other varieties that are certain not to succeed. More complete information must be secured from local nurserymen, from State Experiment Stations, and State Horticultural Societies. There must then be a certain measure of independent experimenting. It is not easy always to explain why an apple should thrive at a certain point, and along the same latitude, be a failure within twenty miles — yet such is the case.

A commercial orchard will always include fewer sorts than a home orchard; but it should never be made up of second rate sorts, because they are temporarily saleable. Pomologists, who can recall the history of the past fifty years, will have nothing more vivid in memory than the tenacity with which the very best quality apples have held their own, while inferior, but showy sorts, have gone out of favour as rapidly as they came in. Spitzenburg, Rhode Island Greening, Northern Spy, Baldwin, Hubbardston, are in growing demand all the time. The Ben Davis still holds a place in large commercial orchards; but it is getting to be more difficult to dispose of where it has become known. Its inability to rot gives it a place on the stand of the apple pedlar, but no housekeeper will ever tolerate a second barrel in her cellar. The Black Ben Davis is more beautiful, of very much better quality, and an equally long keeper. I do not believe it will be possible ever to produce more prime Jonathans, Kings, or Grimes' Golden than will be quickly absorbed by the large markets, at the very highest prices.

A good list of apples for a small home orchard should at least include, for summer, Liefland Raspberry, Red Astrachan, Fanny,

Yellow Transparent; for Autumn, Gravenstein, Duchess of Oldenburg, Strawberry, and Fameuse. For winter varieties the following must not be omitted: Baldwin, Spitzenburg, Grimes' Golden, McIntosh Red, Northern Spy, Rhode Island Greening, Jonathan, Wagener; and if the soil is favourable, King. This list does not profess to be anything like adequate to the needs of a grower who proposes to send a good surplus to market, It simply includes a few of the standard varieties with which a home-maker should begin.

I should like to name a very special list of sorts for an apple lover — an enthusiast, who tastes apples a good deal as a tea-tester tests samples of tea. I do not find this sort of people everywhere; but I think their number is growing. I shall not include in this list some extra fine sorts like Northern Spy, and others sure to be planted; I only propose an enthusiast's nook. If he cannot have a tree of each, he may have grafts of all of them in one or two trees. Here are a half dozen that I think will delight nearly everybody. (1) Stuart's Golden, a small apple of most delicious quality, that is not lost by storage. A very juicy apple, yet it will bear the roughest usage without decay. It is one of the best keepers that I have ever handled. I recommend that it be grafted high in old trees. (2) Wismer's Dessert. This apple is new, but it bids fair to be a model in more ways than one. The tree is a good and rapid grower, and hardy. The fruit has the texture of the pear, most richly aromatic and delightful. (3) Scott's Red Winter. This is not a new apple, but it is rather homely, and I believe not a good market fruit. I find it to be one of the most digestible of all apples, melting in the mouth; while its flavour is spicy and rich. The flesh is a fine yellow. It is in eating from November until April. (4) Walter Pease. I consider this seedling of Fameuse remarkable. It

is larger than its parent, with very much the same flavour. It keeps all winter, so that we have a winter Fameuse. (5) Princess Louise. This is another seedling of Fameuse, and if you get it just right, you get it so good that you will think it surpasses every other apple. It ripens rather before winter stock, and must not be left on the trees until it begins to fall badly. It is as beautiful as good; yellow with red cheeks. (6) Delicious. This is a new apple, originating somewhere in the West, and I think named by Stark Bros., of Missouri. The samples that I received from them are not misnamed. It is magnificent in size, and colour, and truly delicious in quality. (7) Danchy's Sweet. This is the latest sweet apple to come into notice, and it is so much the best that I put it into my select list. It is large and a rich red colour, while the quality is melting and aromatic. (8) McIntosh Red; another seedling from Fameuse, and in my judgment one of the indispensables. The flesh is white, tender, sprightly, and melting.

It will never do to leave out Mother — a medium-sized, golden-fleshed, nearly red apple, of indescribable richness. Prime from December first to March. I have not put in this list a single apple that is not specifically good for a dyspeptic. Each one of them is of the melting sort, scarcely needing the use of the teeth while eating. I am sure that I shall receive the gratitude not only of apple lovers, but of old people for having made out this list. I have not been able as yet to personally test King David and Liefland Raspberry, or as it is spelled by some, Lowland Raspberry. The first of these is described by good judges to be the most beautiful, as well as one of the most delicious apples in existence. It was introduced in 1904; of Russian origin. A. G. Tuttle, of Baraboo, Wis., says of it that there is no apple of better quality to be found in Am-

erica. The tree is perfect, and a good bearer, and the fruit is handsomely coloured. It ripens in August, just before Yellow Transparent. These two apples may fairly be added to our above list of private luxuries. To make a baker's dozen, add Shannon and Senator — both superb.

Crabapples should be grown for three purposes, beauty of tree and fruit; windbreaks; and value of the fruit. The market demand is increasing, and sales, which a few years ago were trivial, are now enormous. Among the best varieties are:

Dartmouth — Fruit of this variety is nearly two inches in diameter, and of very fine quality for cooking or for cider. The colour is dark crimson and orange, with a bloom. The season is from September to December.

Florence — Ranked in Missouri and the Southwest as the best of all the crabs. It certainly is a magnificent fruit — striped yellow and red.

Hyslop — Almost the size of a Summer Strawberry apple — of deep crimson; and very popular everywhere, especially in the West.

Martha — A strong grower, but not a heavy cropper. It is, however, one of the finest of the crabs.

Montreal Beauty — One of the handsomest of the crabs, ripening in October. The flesh is yellow, firm and acid.

Paul's Imperial — Said to be a cross of the Siberian with Red Astrachan apple. It is very handsome, skin yellow overlaid with bright red. In quality it is tender and highly flavoured.

Queen's Choice — This is a beautiful crimson apple, with a whitish flesh and a pleasant acid, ripening in September.

Whitney — This is one of the largest and one of the best of the crabs. The tree is a great bearer and very vigorous. The skin is glossy yellow splashed with carmine. The flesh is firm, juicy, and pleasant.

CHAPTER THREE

THE APPLE—HANDLING AND MARKETING

ONE of our most enthusiastic pomologists, E. H. Johnson of Chester, Pa., writes me: "I hope you will be able to straighten out the nomenclature of apples in uncertain cases. I think it is pretty clear that the Yellow Newtown Pippin is the Albermarle Pippin; but what is the inferior green variety, called by Parsons & Sons the better of the two? Again I hear from Stark Bros., of Louisiana, Mo., that Scott's Winter is bright red, crisp, spicy, and of a brisk acidity. Now can this be our Scott? Certainly ours is not bright red, nor is it briskly acid; it is rather honey-sweet — not as sweet apples are, but as a wonderfully tart apple may be." This letter illustrates the almost impossible problem of identification. Not only the time of ripening of such an apple as Northern Spy changes its winter classification in New York, to fall classification in Missouri, but the flavour also is markedly different. Michigan apples are so unlike New England apples, both in colour and in texture, as to cause many disputes over their identification. You will find in the New York market two and sometimes three varieties of Baldwins. They are all the same Baldwin, but grown on different soils, and under conditions that render them very unlike. Customers who have purchased inferior stock form a bitter prejudice against what may be a really superb fruit.

L. H. Bailey tells us "There are to-day several different types of Rhode Island Greening apple in cultivation; which have originated from variations produced by environment, and by the different models which propagators have had in mind." In the Kirkland orchard, planted by Missionary Kirkland, in 1791; and grafted by my father to old standard varieties, there were Spitzenburgs so very unlike, that those who judge fruits according to the old style of shape, colour, and measurement would not have held them to be identical. In fact they were not identical. They were Spitzenburgs by family right, but had become so diverse in colour, in shape and in texture as to deserve specific names. They had come about through the influence of the stocks on which they were grafted, and by other influences of selection. Just how far back this variation had its origin I cannot say. It remained for me once more to select; and I chose that one type which was deepest red, with yellowest flesh; most solid, and most uniform in shape. This type was nearly round, while other types were oblong as a Bellflower; yellowish overlaid with red, and spongy in texture.

A few of our best growers insist that we must go even farther than I have suggested. We must not only select our cions from those variations which are nearest the ideal type, but we must remember constantly that we may breed weakness and unfertility. Mr. Lux, of Topeka, Kan., tells us that he has demonstrated that by taking cions from symmetrical trees, young and vigorous, and noted for fine fruit, he could get an orchard of the same character; while in adjacent orchards grafted with carelessly selected cions, the results were very different. "Of two orchards planted at the same time, with the conditions in favour of No.

1; No. 1 remains unproductive, while No. 2 is annually yielding fine crops of superior fruit." We certainly have come to a time when more accurate investigation must be made of the results of taking grafts from trees, without consideration of their annual bearing or general productiveness. There is a good deal to be said in favour of "plant pedigree."

The increasing tide from the city countryward, is so rapidly cutting up big farms into very small ones, that economy in orchard room will require more attention to dwarf apple trees. I do not know a prettier sight than a half dozen rows; standing about ten to twelve feet high, with round heads, and loaded either with flowers or with fruit. The varieties best adapted for dwarfing can be determined by consulting any good nurseryman.

It is unfortunate that some of our best varieties of fruit, including some of our finest apples, fail to give full crops without the presence of neighbours to furnish pollen. Among the apples that must be near other kinds, our Experiment Stations report Arkansas Black, Canada Red, Fanny, Gravenstein, Grimes' Golden, King, Mann, Northern Spy, Porter, Primate, Roxbury Russet, Spitzenburg and Winesap, in different degrees of self-sterility. It is desirable to associate with these, varieties that are abundant pollen furnishers. A few in the list are almost invariably incapable of self-pollenation. This explains to the orchardist why large blocks of apple trees, sometimes yielding enormous crops, at other times are nearly barren. The following sorts have exceptionally good records for fruitfulness, when planted in solid blocks — other conditions being favourable; Baldwin, Rhode Island Greening, Fallawater, Rawle's Janet, Oldenberg, Smith's Cider, Red Astrachan, and Ben Davis. It is needful to go a little farther with

this subject. We must have that sort of pollen which is best to give us, not only fruit but fine fruit. The Department of Agriculture reports that different sorts of pollen, furnished to a sterile apple, will make fruit of very different quality and size. The Seckel pear for instance, is much better for having the Kieffer as neighbour, than when it gets its pollen from the Lawrence. The Baldwin apple and the Rhode Island Greening are especially good pollen givers.

If our apple orchards illustrate the very worst features of farming, I am sorry to say that in no other department of work is there manifested such recklessness and waste as in the picking and storage of apples. It is estimated by good authority, that very nearly one-half of the whole apple crop of the United States goes to waste through worms, lack of proper trimming, bad handling during the harvest, and bad storage during winter. It is hardly worth the while to have an orchard at all, of this glorious fruit, unless we intend to make a study of its culture, to treat it lovingly in the handling, and have already prepared such storage rooms as will prevent its speedy decay. The ordinary hired man, if let loose in an orchard to gather the fruit, will jerk it from the limb, drop or toss it into a basket, pour the basketful into a heap, pour it again into a wagon, and then, without rational grading, will pour it into a bin. This bin or barrel is probably stored in an ordinary cellar — not frost proof, and at the same time a musty place, full of bad odours. It may be set down to a certainty that it will not pay any man to store a crop of apples in the usual farmhouse cellar. This is especially true since the furnace has become a common thing in the country. The first cell that is broken in an apple means the first step of decay. This decay is likely to spread, even

if no more bruises are received. With ordinary picking it is difficult to find a single apple without a bruise. This means that the owner will soon begin to say to his neighbour: "This is a bad winter for apples. They don't keep. Mine are rotting badly." He has said this every winter since he raised apples; and he will keep on saying it to the end.

Make it a rule to handle apples like eggs; and discharge any man who will not deliberately lay them in the basket. They should not be dropped even two or three inches — literally laid, with care, one after another in the basket. When the basket is full, let them be laid again by hand into a wagon. When the wagon is full, draw to the cellar; and once more with the most deliberate tenderness transfer to shallow bins. At no stage of the process should they be poured or tumbled.

While transferring from wagon to cellar, the apples should be carefully graded into at least three classes. Grade number one should include only absolutely perfect fruit. Here should be found no samples that are wormy or scabbed, or unfit for placing in the most conservative market. Grade number two should be made of apples which to the eye appear fine, but to your expert judgment are seen to have more or less defects. These apples, if sold early in the season in common market, will bring the average market price. They are not intended for private customers; nor will you run the risk of keeping them late in the winter. Grade number three should consist of those which are more seriously defective, or are too small for grade number one. Many of these will ultimately pass into grade number four, which consists entirely of fruit for cider.

The bins for holding grades one and two should be about one

foot or sixteen inches in depth. They should be easy of access, so that a decaying apple can be readily removed during the winter, We do not expect to be compelled to handle grade number one, until it goes to market. Grade number two should be stored in the same way, and will need more oversight. The cellar itself should be kept thoroughly ventilated until cold weather begins; when it should be tightly closed, and made dark; nor should it be opened again for ventilation until after the crop is entirely removed in the spring. During the winter the thermometer should register but little above freezing. Can the ordinary farmer have such a cellar? I believe it to be quite feasible. It should be placed, as a rule, under some part of the barn or carriage-house, rather than under the dwelling. The walls should be very thick, and the floor above should be battened. If possible let a brook run directly through such a cellar. While mould must not be tolerated, moisture is an absolute necessity in a good apple cellar. In a dry cellar the quality deteriorates, and the fruit shrivels. The United States Department of Agriculture gives some good hints concerning cold storage in Farmer's Bulletin number 119. But what I wish to emphasize is not the advantage of special and laborious methods, but the ease with which a first rate apple cellar can be constructed, I have lined the ceiling of mine with tarred paper. On the floors above I spread autumn leaves quite thickly during the coldest months. The temperature stands at about 33°. I thoroughly spray the bins and walls with Bordeaux each year just before storing the crop.

With such gathering of fruit, and such storage, you may depend upon it that apple growing will pay. It is not a problem, but a certainty. While the waste will be insignificant; better yet will be the training for yourself, and your family, and your help, in the

way of rational treatment of such noble fruit. You will also be able to command the very best market. During those years when farmers, without storage, have been compelled to take from one dollar to two dollars for their apples, I have been able to obtain from three dollars to five. In the spring, when other cellars are depleted, my apples are still in prime condition. Cold storage is therefore a very simple matter. It does not require a costly house, with ice; it only requires a thoroughly cool, clean, and close cellar, away from house heats and secure against freezing.

As a rule, if near a large market, secure private customers, instead of relying upon middlemen. Shipping has become so easy that these men will readily pick up any amount of apples for storage, at prices gauged by the fact that their owners have no adequate storage. By having private customers you do not come into competition with these pariahs in fruit growing. In order to accumulate such a sure and private market of your own, your brand must be as good as your bond. It must be known that your fruit is so graded that it cannot involve disappointment.

I do not intend by what I have said to imply that a barn cellar is an absolute necessity; but a good house cellar is exceedingly rare. I do not know why home-builders content themselves so generally with inconvenient, unventilated dug-outs under their houses. It is economy at the worst point. It leaves the farmer at a disadvantage all the time. His cellar is too cold; and then it is too hot. It is a storage room for all sorts of truck, ill-smelling, and injurious to health. His apple bins and his vegetable bins are the same receptacles, and seldom clean. His apples are flavoured by decaying cabbages and rancid grease. Home-making in the country must begin its reform at the foundation. We must get rid not

only of the danger to health, but of the immense waste caused by lack of cool storage, and cleanliness.

A change is about to take place in the method of delivering apples in the market. Many of our best markets are insisting upon a bushel box as preferable to the barrel. This is not only because of the easier packing and handling, but because the majority of purchasers decline to buy a full barrel at a time. Fancy apples, when shipped in boxes, are found to bring a better price in our own large markets; and they are very acceptable in the European markets. Prof. Blair of the University of Illinois reports that after a thorough study of the subject, he has come to the conclusion that "The barrel is the most undesirable package in which fruit can be exported — from the fact that it can be rolled. It must be remembered that every time a barrel is kicked, to roll it over, every apple in the barrel is jostled, and two jostles make a bruise. In addition, the barrel is too large a single compartment; holding too much fruit, without any relief for the pressure. Whether the barrel stands on end, or lies on its side, the apples at the bottom take the weight of all the apples above. If apples must be carried in barrels, the smaller they are made the better." Packing boxes will be done by hand, and each apple will be properly located. Not one fruit grower in twenty can properly pack a barrel. He will leave it so that after a few miles of travel, and thorough shaking, the apples will be loosened; and from that moment will begin a bruising, that in a long shipment will ruin the contents. The box must be light and strong and clean, and on it must appear the grade of the fruit and the brand of the grower. We are rapidly reaching the time when only carefully graded fruit will be accepted in our markets. The grower's brand must become his pride,

A recent government report tells us that the enormous increase in orchard planting, a process which is going on all across the continent, will require a keen outlook for foreign markets. The export to Europe was never as great as at present, and no limit is in sight. The Orient pledges itself to take all the surplus of the Pacific coast. Meanwhile home consumption in our cities is greatly increasing. The apple crop of the United States during 1903 was thirty-six millions of barrels. In 1902 it was over forty-four millions; while in 1900 it was nearly fifty-seven millions. In 1896 the crop reached seventy millions. There has been no serious falling off in prices, except for those who lack storage. These people must sell when the crop is picked, and at whatever prices speculators may offer. In 1893 when the crop was exceedingly small, farmers without storage obtained no higher prices than in 1896, when the crop was enormous.

As things go, the profit on exported fruit is now divided between the middleman, the shipper, and the foreign wholesale dealer. We have got to understand this matter from the standpoint of the producer. "The time to pick and pack is just before the apples are ripe. It is a safe rule to pick them two weeks before the local buyers would want them picked. Handle them with the utmost deliberation and care. Make a moderate shipment first, and study the results; afterward correcting any errors made in the first shipment. The earliest fruit to reach the market always brings a premium. The first King apples that you can get into Great Britain, will bring nearly or quite double that received for the same variety six weeks later."

There are, according to a late estimate, two hundred millions of apple trees in the orchards of the United States; and these trees

LET THEM STAND IN GROUPS WITH WALKS AND DRIVES CONVENIENT TO THE HOUSE

CLAPP'S FAVOURITE

are supposed to yield somewhere about one hundred and seventy-five million bushels of fruit annually. Good judges predict that five years from now there will be an annual product of five hundred millions of bushels of apples to be sold. In response to this prediction one of the largest dealers in London says: "The American apple is known as the best apple in our market, for it comes to us in excellent shape, as a result of proper methods of packing. Not a few California oranges also find their way into London; while the importation of California pears, plums, peaches, and apples, especially the latter, is steadily increasing. They are the most popular fruits with the London people; and there is no fear of competition from other sources, because they arrive and are consumed before the fruits from other countries reach our market. The Tasmania apple is destined to find good market in London, but it will not enter into competition with your product; for the reason that the whole shipment, for the three months' season, will not exceed five hundred thousand bushels — which is not equal to two weeks shipments from your country. I see nothing that will displace your apples as a popular product in Great Britain so long as the present quality of the shipment is maintained." In fine, we have the market opening to us, not only in Europe but in Asia, that will probably consume any possible surplus, at highly remunerative prices, if we make our American brand absolutely reliable. We can, however, easily throw away our market and ruin the apple business.

CHAPTER FOUR

THE PEAR

THE pear is a very old evolution of the Rosaciæ family. Charred pears are found in the kitchen-middens of Europe, where they were dropped long before the present races occupied that continent. There are two varieties of pear stock cultivated in the United States: the European, brought over by both the French and the English colonists; and the Oriental, brought over from China about 1850, as the Sand Pear. The latter was for a long while grown only for ornament, until a Philadelphia gardener found among his seedlings a peculiar and showy fruit, which he named after himself, the Kieffer — a pear of second quality, but very hardy, and very good for canning and cooking. To this have been added some other sorts, of about the same general quality.

The early varieties of European pear were, however, not much better if as good as the Kieffer. The Bonchretien of my boyhood was a glorious pear to look at, and we then held it to be a dessert fruit; but it would not be tolerable to our educated tastes. Fruit evolution has been very rapid during the last fifty years; ending in such pears as the Sheldon, the Seckel, the Anjou, and many more equally luscious.

The pear tree grows more erect than the apple, and needs so much less room that it is more acceptable for a garden and a lawn

tree. Indeed there are few lawn trees handsomer than an Anjou pear; while for hedges and windbreaks, the Buffam is just the thing. It can be planted in close rows, and it grows as erect as a Lombardy popular. Its leafage is superb, and its fruit, while not the best, is good enough for dessert, and most excellent for pickling.

The pear takes kindly to all soils, but prefers loose and strong clay. In sand it grows rapidly, but is liable to split its bark, and soon dies. As a rule, pear growth must be stimulated very little, certainly not by placing manure about the roots. There is, however, a difference in varieties, and it will be found that the Seckel will need a good deal more nourishment than some other varieties, in order to come to its best in growth and fruit.

Trimming the pear is a matter that must be attended to, from the outset, with great care. When the tree is first planted it should be sharply cut back, and only those buds allowed to remain which will form the head correctly. Suckering buds must be rubbed off from the body of the tree frequently. For three or four years the tree must be watched carefully, not only to cut off the superfluous shoots and keep the head open; but at least one-half of the new growth must be cut back in late Autumn. As the tree grows older, and gets out of reach, with a step-ladder, this heading-in can be suspended. However, the pear tree must never be left to itself, any more than an apple tree, to send out suckers during the summer. These devitalize the limbs, weaken the old wood, and soon make it brittle. In trimming a pear tree, do not fall into the rather common error of supposing you can make an ideal form. No tree is more individualized in its varieties than the pear. The Clairgeau grows nearly upright, with stiff limbs, as does also the Buffam.

Neither of these can be cut down from the top without ruining them. The Seckel naturally takes a roundheaded form, while others, like the Anjou, form a very fine pyramidal head. A pear orchard of mixed varieties, presents a much more unique appearance than an apple orchard — differing very decidedly in the ideals which the different varieties suggest. I emphasize this, because we frequently hear of the "ideal pear tree."

In the orchard some varieties need pollenation, or they will be barren. I am sorry to say that in this list we find those magnificent fruits, the Bartlett and the Anjou. The latter I have grown in many localities, and while one which stands close by a Louise is an annual bearer, another growing on a shrubbery lawn is almost totally barren. From the former I have picked hundreds of bushels during the last thirty years, and from the latter not one. The Kieffer is called imperfect, but with me it is not so. Among the best pollenizers may be placed the Louise Bonne and the Superfin.

The pear is on the whole more healthy, and better able to take care of itself than the apple. But when blight appears it needs all the skill of a watchful gardener. The blighted limbs, which are liable to appear very suddenly, should be cut off at once, and burned. Cut a little below the part which is apparently diseased; and if a tree is badly affected, dig it out at once and burn. Pears planted in sod land — with mulching of course — are found to be less subject to blighting than those which are highly cultivated in orchards. Cracking of pears is caused by a fungoid parasite, which must be promptly met with Bordeaux mixture — applied three or four times; beginning before the buds open in the spring. Some of our best varieties, notably the Flemish Beauty, are so subject to this cracking of the fruit as often to become worthless.

The quality of pears differs with the years and seasons, as well as with the degree of culture which the trees receive. This must be borne in mind in testing varieties, or you will reject some of the most valuable. Winter pears especially will vary from year to year, in your cellar, from utter worthlessness to standard excellence. The late autumn varieties, like the Anjou, should remain on the trees as long as possible, in order to secure a rich flavour. They are then to be put away in dark storage rooms, and will prove to be of the very highest quality at their proper season for ripening. This is quite contrary to what we have to do with summer pears. Nearly all of the early ripening sorts must be picked eight or ten days before softening, and then ripened in a cool, dark room. If this process be neglected, many of the best sorts will not only be without flavour, but will rot at the core. Clapp's Favourite, for instance, is absolutely worthless if ripened on the tree, but picked quite before ripening, with proper handling and storage, it is hardly surpassed by any other pear in the orchard.

A pear orchard should, if possible, face to the north or east, in preference to the south. It is essential that the body of the pear tree be somewhat shaded from the heat of the sun at midday. For this reason pear trees should be secured from the nursery, headed low — three or four feet from the ground. This will disturb plowing and cultivating, and necessitate considerable work about the trees with the digging fork. Still, taking it all in all, except in large orchards, I prefer the low-headed tree. They are more easily trimmed, and the fruit is gathered without breaking the limbs with ladders. A pear tree at twenty years of age, with proper pruning, should be accessible in all parts from a step-ladder — except possibly the tips of a few tall-growing sorts.

While not a particle of barnyard manure should be placed about the roots of pear trees, when they are being planted, it may be spread with some freedom around the trees as mulch. I prefer, however, a very free use of coal ashes in the orchard. This should in all cases be from anthracite coal, and not from bituminous, which contains too much sulphur. The value of coal ashes is very great in loosening the soil, in retaining moisture, and assisting vegetation to secure nourishment from the air. Commercial manures for pear trees should include potash and salt.

Pear trees fit for planting should be stocky; rather than the whip stalks which are sent out too often by nurserymen. These withy trees will generally live, but they will rarely grow. While a properly developed and stocky tree will in five years be giving us a fine crop, the little pinched and spindling trees will remain about as they came from the nursery. In digging be very careful not to expose the roots to sunshine and air; in planting cut back sharply, and never fail to have the mulch around the tree before the moisture has evaporated. If trees reach you badly dried, heel them in moist soil, (not wet) and then cover with wet straw. Let this be done in the shade. As you set each tree, draw it carefully from under the straw, and when placed in the hole, puddle as the dirt is shovelled in — that is, pour in a pailful of water. Ram down the top dirt very tight, then throw on a shovel full or more of loose dirt, to act as mulch until ashes or manure can be applied.

Pears are classified in the catalogues as standards and dwarfs. As a matter of fact very few of our best pears do well when grown as dwarfs. I have not had eminent success with anything except Duchess and Louise. Besides these, with special care, you may grow on the quince — that is dwarfed — the Bartlett, Margaret,

Hardy, Howell, Superfin, Urbaniste, Anjou, Lawrence, Josephine and some others. My advice to the unskilled is to plant standards as a rule, and fight shy of dwarfs.

Pears may be had the whole year round. The list of excellent varieties has been so greatly increased that we may grow winter pears as we grow winter apples. In December we may enjoy the Reeder; a little later the Lawrence and Anjou, which may be justly called our Christmas pears; still later our cellars may hold Josephine and Patrick Barry, as they hold Northern Spy and Newtown Pippin — that is until May.

The curculio does considerable damage to pears, and also the codlin moth. Both must be met by frequent spraying of arsenical mixtures. During the last few years the pear psylla has made havoc in the orchards of New York State, New Jersey and New England. The best remedy is thorough spraying with whale oil soap solution. Bear in mind that the little white-faced hornet is of immense value from the fact that it destroys millions of such insects in the larva state. Their nests of paper will follow very closely after the appearance of the psylla, and should never be destroyed. This little hornet rarely troubles man or beast.

For summer varieties we may select from the following:

Alamo — A really excellent new pear, ripening just after the first varieties, and of splendid quality for dessert.

Bartlett — This variety still remains one of the most popular, both for dessert and for canning. It is large, handsome, buttery; and it has a peculiar flavour much relished by most people. The tree is vigorous in growth — but needs good tillage, especially while young — bears very abundantly, and while young.

Brandywine — This is a medium-sized, yellow and russet pear, juicy and of excellent quality. A good grower, and yields abundant crops. It is one of the earliest of our really good pears.

Clapp's Favourite — A very large and very beautiful pear, and if picked early from the tree, of the highest quality. The tree is hardy and vigorous and very prolific, but somewhat brittle in wood.

Dearborn's Seedling — A small but excellent pear; bright yellow and of excellent quality — ripe the last of August.

Giffard — This excellent pear ripens about the middle of August, among the very earliest. The tree is hardy and enduring, but not stout. It bears heavy crops, very regularly.

Koonce — A new pear, quality not the highest; but ripens in July, before Tyson, and is exceedingly handsome.

Manning's Elizabeth — Another small, bright yellow pear, very juicy, and always welcome as a dessert fruit. The tree grows slowly, but bears well.

Marguerite — A grenish-yellow pear, with a dark red or brown cheek. The quality is superb; while the tree is a strong upright grower, and bears heavy crops. One of the best summer pears.

Rostiezer — A pear that would rank among the best, only that the tree is very sprawling in growth, and the fruit of a dull green. Whoever has eaten a Rostiezer will wish to have them every year.

Souvenir Du Congress — A very large pear, something like Clapp's Favourite in appearance — bright yellow with a carmine cheek. A capital home pear, because it ripens all through the month of September.

Tyson — One of the earliest, and of the very highest quality. Although the tree is vigorous in growth, it does not give fruit till somewhat advanced in years; but after that is an abundant bearer.

Wilder's Early — A most delicious very early pear. The tree is hardy and a good bearer. Yellow with a brown cheek, rather small, quality melting, sweet, and to be classed as very good.

For autumn varieties we may select:

Belle Lucrative — Medium sized, greenish yellow — not at all showy, but very sweet, and when well-ripened, delicious. I find great difficulty in ripening this pear perfectly. It overbears, and must be thinned early in the season.

Bosc — A very large russety pear, with a long neck. When well-ripened it is of the most delicious quality. The tree is a poor grower, and should be double-grafted or top-grafted to make good standard trees.

Boussock — A large pear, of excellent quality. The tree grows rapidly, and vigorously, and bears heavily. A capital pear for market, and in quality ranks next to the best for dessert.

Doyenne, Grey — This medium-sized pear ought not to be dropped out of good orchards. It is russety, and otherwise may be supposed to resemble the White Doyenne. The quality is very fine.

Doyenne, White — One of the grandest of the old standard sorts. It has been grown for a long while in Europe, and in the United States, and is as popular as ever; is equally good for cooking and dessert. The tree is a handsome, vigorous grower, and bears heavy crops. To prevent cracking it must be sprayed early, and frequently with Bordeaux.

Duchess, or Duchess of Angouleme — This is the largest pear among good ones. It is grown mostly nowadays on dwarf trees. It is one of the few really profitable dwarfs. It requires warm sandy soil to come to perfection.

Fame — One of our newest pears, and of remarkable qualities; while the tree is vigorous and a great bearer.

Flemish Beauty — A magnificent pear, and one of the few that may ripen on the tree without being rendered entirely flavourless. The tree is a noble grower and bears abundantly; but it must stand in the open sunshine and air — otherwise the pears will nearly all become worthless with cracking and mildewing. Spray very thoroughly, early and often.

Frederick Clapp — This is a lemon-yellow pear, of fine flavour, and belongs among those few varieties that are acidulous instead of sweet. It will keep well through November.

Hardy — A large russety pear, of fine quality. The tree is very stout and bears excellent crops.

Hoosic — This very good pear is not as well known as it should be. The flesh is fine-grained, and has a peculiar spicy flavour, classing it among the best for the table.

Howell — One of the noblest of our American pears, large and handsome; but with me not very productive. The tree is vigorous in growth and hardy.

Idaho — A new pear, golden yellow; and flesh melting and juicy. It is said to be very hardy, vigorous, and prolific, but still needs testing to determine its position over the whole pear belt.

Kieffer — This comes from a seed of the Chinese or Sand pears, supposed to be crossed with the Bartlett. The fruit is large — generally very coarse and only fit for cooking.

Lady Clapp — A new sort; very large and very handsome, with beautiful yellow skin, when ripened. The quality is juicy, and places it among the highest. It ripens early in autumn. The tree is healthy, and a good bearer.

Louise Bonne — A large, long, yellowish-green pear, generally with a rich dark red cheek. This is one of the best pears to be grown on the quince. The tree is very handsome, very erect, and a very bountiful bearer. It needs severe thinning, or much of the fruit will be worthless.

Onondaga — Formerly called Swans' Orange; one of the largest and generally one of the best. The tree is stout, vigorous in growth, and extremely productive. Always acceptable in market, and one of the best for canning.

Rossney — Medium sized, yellow, with a crimson blush. Recommended by Stark Bros., as admirable for the middle west. It ripens in early autumn.

Rutter — Large yellow and very buttery-fleshed. The quality is fine; and it is recommended as good for canning.

Seckel — This little pear has had a romantic history, coming from a hedge somewhere in Pennsylvania. It has attained the rank of standard in quality; but is too small to hold its former high position in market. The tree is sturdy, but not a tall grower, and very roundheaded.

Sheldon — If compelled to select one pear for my own use, and one alone, it would be the Sheldon. The tree is an erect grower, but not very long lived. The pear is a greenish russet in colour, of very large size, and somewhat flattened in shape, like the Bergamots.

Superfin — A large and very handsome golden yellow fruit, of the subacid flavour. The tree is vigorous, and gives a splendid crop of clean pears, when nearly everything else is spoiled.

Later in the autumn we have a group of pears of the highest quality, that if carefully picked and carefully stored, will be in

good condition for the table until midwinter. A few at a time may be brought into a warm room, and ripened as they are needed.

Anjou — One of the Buerre, or butter pears, originating in France, This variety is ideal, both in tree and fruit; one of the most delicious, and one of the most valuable to be grown for market — if rightly grown and handled. The tree forms almost a pyramid, is very vigorous, and long lived; and bears annually enormous crops. The fruit is so heavy that it is liable to be blown off just before ripe. It is well to grow this sort in grass, with mulching. Pick late in October, and expect to place it on the market for Thanksgiving.

Clairgeau — An enormous fruit, exceedingly attractive; a rich greenish yellow, largely covered with brownish red. As it ripens it has the bad habit of turning black with the slightest rubbing. The tree is clubbed in growth, but bears heavy crops.

Dana's Hovey — A small pear of very high quality. The tree grows much like the Seckel.

Jones — One of the newer pears, very sugary and of rich flavour. It is of medium size, and russety. The tree is an upright grower and heavy cropper.

Lawrence — An early winter pear, almost universally liked; with me rather small, but on some soils it grows much larger; fruit a rich yellow, and very sweet and aromatic. The tree is a slow and irregular grower, but a most abundant bearer.

Lyerlie — Claims to be equal to the Bartlett; and aims to supersede it.

Reeder — A superb pear for the table; but of medium size, and not very taking for market. The tree is a poor grower, yet bears well. The pear ripens in November, and keeps through December.

Winter Nelis — This pear runs us quite into early winter. It is a homely affair, and it grows on a straggling tree; but it gives heavy crops, of the most delicious fruit, if well ripened.

Worden's Seckel — Sometimes called Winter Seckel. The fruit is of medium size, but in quality ranks very well with its parent — the Seckel.

We have been slowly developing a class of pears that may be stored like winter apples, and ripened up at any time during the cold season — as late as March and April. Every family should be supplied with one or more of these sorts. Among the best are:

Col. Wilder — A seedling from California, of the very highest quality. The pear is large, yellow, and dotted with russet. The tree is rather weak in growth, and may be double-worked with advantage.

Directeur Alphande — Large, yellowish green, dotted with russet. The flesh is sweet and highly flavoured. With me the tree is vigorous, but has not borne well — although it has the reputation of being a great bearer.

Easter Buerre — One of the butter pears, large, and yellow with a red cheek. The tree is a poor grower, but bears well. The fruit keeps all winter.

Josephine — A sort of everybody's pear, growing with the greatest ease, on a somewhat irregular tree; fruiting very early, and in great abundance, annually. The pears are borne in clusters, and the crop should be sharply thinned. Quality fine; flesh yellow.

P. Barry — Another of the long-keeping seedlings from California. Large, yellow, and covered with russet dots. The flesh is buttery and fine-grained, and flavour very rich. It resembles

Anjou in texture, and Winter Nelis in colour; keeps till last of May. It must be top-grafted to make fine growing trees.

President Mas — A large irregular shaped pear, with a yellow skin; flesh juicy, vinous, and very good. Keeps until the first of February.

This list does not assume to classify and describe all the really excellent pears now under cultivation. It also omits quite a number of old favourites, which I believe must be dropped from general cultivation, for those of later and better introductions.

If I were to draw up a list for a small home, of indispensables, I should include, for summer, Bartlett, Clapp's Favourite, Tyson, Rostiezer and Alamo. For autumn bearing I should include Flemish Beauty, Fame, Onondaga, Seckel, Sheldon, Lady Clapp, and Rossney. For later autumn and early winter we must surely have Anjou, Lawrence, Jones, and Worden's Seckel. For late winter Josephine, P. Barry, and President Mas.

Those families who can only plant four or five trees should select Clapp's Favourite, and Bartlett for early; Sheldon and Seckel for later; with Anjou and Lawrence for early winter. As a pear tree occupies a close corner, where an apple tree would reach beyond bounds, it is particularly adapted to small lots and to city yards. Where the space is very confined, the list should be modified to erect-growing trees, such as Bartlett, Sheldon and Anjou.

To grow fine fruit it is very necessary to thin pears early in the season, and it is equally necessary to keep the heads open to the sun. Old pear trees can sometimes be renovated by cutting back the top, part at a time, for two or three successive years.

It is not infrequent that pear trees get checked in their growth, even when quite young. The bark thickens and hardens, and the

annual growth is limited to a few inches of feeble wood. If this occurs either in young or in old trees, scrape the bark very severely, and wash with kerosene emulsion. Repeat this wash every month, for a whole year. Dig about the tree, and feed it well; keeping it always thoroughly mulched with barnyard manure. Do not hesitate to throw about it kitchen slops, soap-suds, and occasionally a little brine. You will probably be able to start it into fresh growth. Keep it well fed; and the bark may need scraping so close that it might be called paring. I have great faith in heavy mulching for the pear tree. The cover crop applied in August, and turned under in the spring, to be followed by the cultivator will probably keep orchard trees in perfect condition. It is the tree which you have planted near your house, and in your lawn that is likely to get stunted. No tree can take better care of itself when well grown, than the pear; yet none responds more cordially to kind treatment.

Pear growing was an enthusiasm of the middle of the nineteenth century. You should have seen one of the old-time pear parties, when a half dozen enthusiasts came together, with their samples of new sorts — to test, compare, and rub their hands with delight. The excitement caused by the Seckel, by the Clairgeau, and the Anjou, when introduced can hardly be understood by the orchardist of the present day. Some of us can look back, however, to the old Harvest pear trees, or to the little Butter pear, associated with boyhood, and quite appreciate Tennyson when he sings:

"O sound to rout the brood of cares!
The sweep of scythe in morning dew!
The gust that round the garden flew,
And tumbled half the mellowing pears!"

CHAPTER FIVE

THE PLUM

THERE has been an almost total revolution in plum growing within the past thirty years; greater than in the cultivation of any other orchard fruit. Our native varieties have been collected and classified; and have been improved both by selection and crossing. The so-called Japanese plums have been multiplied greatly; mainly by cross-breeding. There are in fact very few real Japan plums; but a very large number of varieties in which there is Japanese blood. Prof. Bailey tells us of a letter from Japan, asking him to aid the writer to secure a lot of these Japanese plums, to be imported into Japan — where they were entirely unknown. The real Japanese plum is a wild floriferous affair, loved by poets, and grown almost wholly for its blossoms.

Beside the native stock, and the Japanese, we have the old European type, generally classified as the Domestica. These three types may be greatly subdivided, but it is hardly worth our while to discuss these possible sub-classes. Specialists make ten groups; and of the old historic plum five subordinate classes — the prunes, the damsons, the gages, the egg plums, and the myrobalans.

The Gages head the list for richness, beginning with the Green Gage; Coe's Golden Drop, and Peter's Yellow Gage lead their class in the yellows, while Bradshaw, Magnum Bonum, and

Bleecker lead in the purple class. Shropshire Damson is the best of the small plums. Of the prunes the more common are the Fellenburg or Italian, and the German; but in California the Silver Prune, the Hungarian and Burbank's Sugar Prune take first rank. A prune is simply a plum adapted to drying. The Silver Prune is a seedling of Coe's Golden Drop, and the Hungarian Prune is identical with Pond's Seedling plum. The nomenclature is worthless, only for market purchasers.

Some enthusiastic horticulturists have orchards of nearly or quite two hundred sorts of our native plums. Many of these are hardy enough to endure a Wisconsin winter, and are therefore objects of great domestic importance, where only a few sorts of fruit can be grown. They are either very prolific bearers, or are made to be such by furnishing adequate pollenation. They grow in a wild wayward way, and it is not easy to train them to the requirements of an orchard. Among the best for general culture are Weaver, Moreland, Hawkeye, Milton, Wayland, Cheney. With me Hawkeye will perhaps take the precedence. As a rule those of us who live in a plum section prefer to plant the European and the Japanese hybrids.

These hybrids are the wonder of pomology. They were first brought to general notice in 1893 by Mr. Burbank, of Santa Clara, Cal. Since that he has sent out, almost yearly, remarkable productions, which have created a new era in plum production. I find in a single catalogue of hybrid Japanese sorts, Burbank, America, Climax, Gold, Gonzales, Matthews, Olivet, Red June, Shiro, Sultan, Wickson. All of these are hardy in my own grounds. Most of them are hardy even in New England, and have so widened the plum horizon, and so excited the fancy of the people, that thousands

of trees are planted where no plums were grown before. There is no probability that Mr. Burbank has more than begun his work; while others, like G. L. Taber of Florida, Theo. Williams of Nebraska, J. S. Breece of North Carolina, and W. A. Yates of Texas are adding valuable acquisitions. "No one unacquainted with this unique work can form any conception of the labour and study which Mr. Burbank's discoveries have involved. The work is conducted so quietly that no one, except the great experts of the plant world, understand just what is being done. He is the Shakspeare of the vegetable world." Another writer says, "Luther Burbank has done more than all the rich men of California — who have worked in the political vineyards."

The first study of hybrid plums was conducted by the Vermont Experiment Station. In their latest report there are thirty-nine varieties described, many of them entirely hardy in New England. They are always to be preferred where soil is light or sandy. They dislike cold and wet soil. Most of our natives also dislike soil that is cold, and not thoroughly drained. The American hybrids are to be treated according to which parent dominates the growth; but in all cases, thorough drainage is a matter of importance.

Of Domestica or European varieties the most important are:

Bavay, or Bavay's Green Gage — Sometimes called Reine Claude. This plum very strongly resembles Green Gage in colour and in quality. It ripens, however, at least a month later. It is one of our very best late plums.

Bleecker or Lombard — Better known for canning and culinary purposes than almost any other. The tree is a very rapid grower, bearing when quite young, and much given to suckering. It is not

A PLUM ORCHARD

WE CAN AFFORD TO GROW PLUM TREES, EVEN IF THEY ONLY LAST TEN YEARS

long lived, but can be easily renewed. It is a plum of medium size, purplish in colour, and yellow flesh.

Bradshaw — A remarkably good plum, and very early; colour dark violet red. The tree is erect and a good grower.

Coe's Golden Drop — One of the plums that cannot be spared from the orchard. Light yellow, quite large, and borne in great profusion, it ripens the very last of September. The tree is a rapid grower in good soil.

Diamond — An old English plum of enormous size, and good quality; colour dark purple. It has recently been brought more into notice; ripens in September.

Duane's Purple — Very large and showy, a little like the Lombard. The flesh is sweet, and clings to the stone; quality fairly good, and the tree very productive. It ripens early in September.

Fellenberg or Italian Prune — One of the best of the prunes. The fruit is purple, parts from the stone, dries readily, and is of delicious quality — ripening in September.

Field — A new plum, said to be a seedling of Bradshaw; of good quality, and ripening in midseason.

German Prune — One of the oldest varieties, and frequently is known by its seedlings, which vary largely from the original stock. The tree is vigorous and productive; the fruit medium sized, and of fair quality.

Giant, or Giant Prune — Introduced by Mr. Burbank in 1893; very large, dark crimson, with yellow flesh, and of fine flavour. It is not recommended for drying.

Golden Prune — A seedling of Italian prune, ripening in midseason. The quality is good, and the tree productive; skin and flesh yellow.

Goliath — A dark red plum, with blue bloom; flesh greenish yellow; quality fair, ripening midseason.

Grand Duke — One of the finest of the late plums. It greatly resembles Bradshaw, except in time of ripening. One of the best plums for market.

Green Gage — A medium-sized plum; but the standard for quality. Should be grown in the sun. On its own roots I find it to be a rather slow grower, but very long lived. It bears immense crops, and is very profitable.

Gueii — A rather coarse plum, but of good size, very hardy, and very prolific. The flesh is greenish yellow, and the season medium. It is growing in popularity as a market fruit.

Hand — Of the Green-Gage type; flesh yellow, rich and sweet. Season September.

Huling's Superb — An old plum, ripening in August. The fruit is very large, green in colour, with yellow flesh — sprightly and rich.

Imperial Gage — A large plum of greenish colour, and splendid quality. A vigorous grower and very productive — ripening in August.

Jefferson — A thoroughly good variety, yellow with a red cheek; flesh golden, and quality rich and juicy.

Lincoln — A large fine fruit, of a reddish purple colour, ripening early. I find the tree unproductive and not entirely hardy.

Lucombe's Nonsuch — One of the Green-Gage plums in type, of fine quality — green shaded with yellow, and flesh orange. The tree is a good grower, ripening its fruit in August.

McLaughlin — A superb plum for either family or market; large, round, and greenish yellow. The tree is a good grower, ripening its fruit in August.

Monarch — A new plum in this country, of English origin and of great promise. It is an abundant bearer, and good grower. The fruit is very large, of dark purple blue — quality of the best. Ripens in October.

Orleans or Red Magnum Bonum — A fruit of the highest quality, ripening about the 20th of August. The tree is a strong grower, and very productive, but not long lived. Not a good self-pollenizer.

Peters' Yellow Gage — The best yellow plum that I know; a bright yellow, with rich juicy flesh, of very high quality. The tree is a clean good grower, bearing well.

Pond — A magnificent plum in appearance, and in quality good. The tree is a vigorous grower, and bears very heavy crops; one of the most showy plums in cultivation — excellent for market.

Prince Engelbert — Early, very large and long, deep purple in colour, and of capital quality. The tree is a good grower.

Quackenboss — A valuable market plum; deep purple, covered with a blue bloom. Flesh yellow, juicy, sprightly. While not best it is really good. The tree is a great yielder, and vigorous in growth.

Sharp's Emperor, or Victoria — I consider this one of the best plums in cultivation, for general planting. It is of the largest size; red in colour, and the quality excellent for dessert, but better for cooking. The tree is somewhat irregular in its growth, but bears regularly, and abundantly.

Shropshire Damson — The best of the Damsons; oblong in form; dark purple, and borne in great profusion. The tree, though vigorous for a while, is not long lived.

Spaulding — A new plum, of medium size; sweet, and good. The tree is a good grower, ripening its fruit midseason.

St. Lawrence — A large round fruit, of dark blue colour, and yellow flesh. It ripens in the middle of August, and is a cling-stone — with me not a good grower.

Washington or Bolmer — A large round fruit; green, sometimes touched with red; and generally classified as of high quality. It ripens the end of August.

Yellow Egg — A very coarse yellow plum of the largest size, ripening in August. The tree is a prolific bearer and a good grower; while the fruit is ranked high for canning and cooking.

Yellow Gage — A large yellow oval plum, of fine quality, ripening in early August. The tree is very vigorous and very productive.

This list is sufficiently comprehensive, and covers most of those offered in the best catalogues. If any one desires a more complete study of the Domestica varieties, consult Professor Waugh's "Plums and Plum Culture."

It will be impossible to catalogue anything like a perfect list of the Japanese plums, with their hybrids, simply because they are multiplying so rapidly.

Abundance — Imported from Japan as the Botan. This variety is very generally disseminated, and proves to be a strong thrifty grower, very hardy and very prolific. The fruit is of a light red covering a yellow ground — flavour sweetish and not very rich. It ripens early, and should be picked from the tree before ripe; storing it in a cool dark room for a few days.

America — One of Mr. Burbank's productions, of medium size and fair quality. Bright golden yellow, with a bloom; flesh yellow and firm. The tree bears very early.

Apple — Also from Mr. Burbank. The fruit is large and looks like a small apple. The quality is good; the colour a reddish purple. The foliage is very large, and thrifty, and the growth rapid and fine.

Burbank — Said to be imported by Mr. Burbank. It is one of the plums most universally planted of late, and almost everywhere successful. It does not rot on the tree, while the quality is exceedingly good. The growth of the tree is so straggling as to require sharp pruning.

Chabot — Comes from Mr. Burbank, either as an importation or as his own production. The tree is a strong upright grower, and a good bearer; the fruit a dull red on a yellow ground, and very sweet and rich. A thoroughly good plum for general planting.

Chalco — From Mr. Burbank, and introduced in 1898. It has been very thoroughly tested, and is of the finest quality, sweet and sugary; much the shape and colour of a tomato.

Climax — Considered by Mr. Burbank one of his best productions. It is hardy with me, and fruitful. One of the earliest to ripen, of very rich fruity flavour; flesh yellow and firm.

Combination — One of the Burbank plums; handsome, large, and very early; colour light crimson; pronounced by good judges as good a plum as they ever tasted.

First — Mr. Burbank says this plum ripens fully three weeks earlier than Red June. He believes it to be the largest, handsomest and most productive of all very early plums.

Gold — This has proved to be very hardy in the North, while the fruit is handsome and of high quality.

Gonzales — Fruit about the size of Burbank; bright red, and yellowish dots; very sweet, with pleasant flavour — a capital dessert fruit. The tree has proved with me absolutely hardy.

Hale — From Mr. Burbank as an importation. The fruit is rather large and globular; deep yellow, mottled with red; is juicy but not of the highest quality.

Kelsey — The first Japanese plum introduced into America. The tree was found to be too tender for the Northern States; but where it is hardy, the fruit is attractive and profitable.

Maynard — Reckoned by Mr. Burbank as one of his best plums. Very large; deep dull red with dots; flesh yellow and meaty; rich, sweet, and extra fine for dessert.

Occident or Sultan — Described below as Sultan.

Red May — From Mr. A. L. Bruce of Texas. The fruit is of good size, deep red; considerably like Red June, only earlier.

Red June — A Japanese importation, of good quality; early in ripening, flesh yellow, and of good size. The tree is of a sprawling growth, and prolific. Its popularity lies in its early ripening.

Satsuma — Imported by Mr. Burbank; popular in some parts of the United States. The fruit is large, of a brilliant colour, while the flesh is dark red. Not hardy in the Northern States.

Shiro — A noble plum of large size; clear light yellow, with a white bloom; ripens two weeks before the Burbank. The quality is rich and juicy.

Sultan — One of Mr. Burbank's hybrids; of delicious quality and a splendid shipper. The flesh is dark crimson, subacid and fragrant. The tree is a rapid and good grower, and very productive. Not yet sure to be frost proof. Ripens with Burbank.

Vulcan — Also from Mr. Burbank, a very promising fruit; sweet in flavour, of very dark purple colour; red in the flesh.

Waugh — A hybrid, of fine quality; while the tree is very vigorous and very prolific. The ripening season is very late.

Wickson — One of the largest of Mr. Burbank's productions. The tree is a strong, but very upright grower. The flesh is solid, but tender and fine for eating. For marketing the fruit should be picked quite green, and, like Abundance, will colour up well after being removed from the tree.

Willard — A Japanese importation, of rather poor quality; early in season. The tree is very vigorous, very hardy, and prolific.

The dominant group of our native plums is called the Americana. The tree is low-headed and spreading; with thick thorny and bushy top. The Nigra is closely assimilated to Americana in growth. The Miner group is possibly a little less coarse and thorny; while the Wayland group presents stronger growers, with long, smooth and willowy branches. The Wild Goose group is characterized by long pointed leaves and smooth limbs; while the Chicasaw takes a shrubby form, generally growing only five or ten feet high, with slender branches. For any farther study of these the reader may be referred to Professor Waugh's "Monograph on Plums and Plum Culture." The varieties that most deserve our attention are:

Atkins — Large bright orange with crimson blush; flesh yellow, and quality exceedingly good. Season medium.

Bixby — A large sized plum; crimson overlaying orange; yellow flesh and quality very good — ripening medium.

Budd — Named after one of our ablest pomologists, Professor Budd, of Iowa. The tree is very upright, and produces enormous crops, of very large size plums, unexcelled in quality; brilliant red with dots — ripening September first.

Champion — A large round fruit; colour red; flesh yellow; of excellent quality — ripening late.

De Soto — A very well known plum; orange shaded with crimson; flesh yellow; and the tree a great cropper. Quality of the best.

Diana — From H. A. Terry of Iowa; vigorous in growth, and a great bearer of fine fruit. The colour is yellow overlaid with red.

Forest Garden — Very generally planted, where natives are popular. Large and round; colour purplish red; flesh yellow; and quality exceedingly good.

Gaylord — Large, of a dull crimson colour; flesh yellow, quality good and season early.

Hawkeye — Very large; colour dull red; flesh yellow; and quality good to best — rather late in ripening.

Kieth — Pronounced by Professor Waugh to be one of the best of the Americanas. Of large size; colour orange, overlaid with crimson; and quality good to best.

Queen or Golden Queen — Very large bright golden yellow, of fine quality and ripening rather early. The tree is an upright grower.

Rockford — Medium sized, dark wine red, with yellow flesh; quality good to best.

Rollingstone — A popular plum, dark red; flesh yellow; quality fair, and season medium.

Smith — Very large, crimson, overlying yellow; flesh yellow and firm; quality very good; season medium.

Stella — Noted not only for its large size and fine quality, but for its very early ripening.

Stoddard — Very generally planted; of large size and yellow flesh; quality good, and season medium.

Weaver — A popular plum, and very reliable for general planting. The size is large, and the colour orange laid over with red. Quality is at least good, while the tree is a strong, upright grower, and very productive; season medium.

Wolf — Medium sized; crimson over orange, skin thick and tough; flesh yellow; tree a good grower and productive; ripening medium.

Wonder — Large round fruit, resembling Green Gage in colour and in flavour; ships well, and is early in ripening.

Wyant — Introduced by Prof. J. L. Budd, and grown by Mary A. Wyant in 1871. Medium in size; red with a blue bloom; flesh yellow, and quality good. The tree is a strong grower and very productive.

From the Nigra group we may select;

Aitken — Size rather large; yellow flesh and season early. This variety is growing in popularity.

Cheney — One of the best and hardiest of all our natives; dark red; flesh yellow and firm and quality fine. A vigorous upright grower, ripening its fruit early.

Smith's Red — Is the only other plum from the Nigra group that need be noticed; but pronounced by some to be the finest in the group. Size extra large; dull red with yellow flesh; season of ripening medium.

Of the Minor group select;

Forest Rose — Quality good; size large, and ripening season late.

Minor — One of the oldest native plums; of medium size, yellow flesh, and only fair quality.

Oren — A variety reported on very well by Craig. Of large size, dark red colour, and deep orange flesh. Quality very good.

Surprise — Another Minor plum, of large size; colour bright red, and flavour rich. Prof. Goff thinks it the finest of all native plums.

Of the Waylands, the best are:

Cumberland — Of large size bright golden yellow; quality good and popular in the South.

Golden Beauty — Very bright yellow, with firm yellow flesh, excellent quality.

Moreman — Noted for its hardiness, and greatly planted in the Northwest; cherry red and yellow flesh.

Wayland — A large red plum of good quality. Tree a vigorous upright grower, and very healthy.

A good selection from the Wild Goose group would include:

Downing — Large, with yellow flesh, and colour bright red; quality excellent, and season of ripening rather late.

Dunlap — Of large size and red: quality excellent and a good shipper.

Keoh — Sold by Stark Bros. as Poole or Poole's Pride. Described as a marvellous bearer; perfectly hardy; and the flavour delicious. The fruit of medium size; colour bluish, and flesh yellow.

Milton — A seedling of Wild Goose, and one of the best of the group. Ripens three weeks before Wild Goose; bright red, with yellow flesh; sweet.

Wild Goose — Medium size; bright red; quality fairly good; the tree is a healthy grower, but entirely self-sterile.

Of the Chicasaw group select:

Cluck — Said to be one of the best of this group; of medium size and yellow flesh; quality fair and season late.

Munson — Long oval; size medium; flesh yellow, and of good quality.

Newman — Very generally planted, used to pollenize Wild Goose. Fruit medium in size, bright red, flesh yellow.

Pottawattamie — Medium in size, bright red; yellow, firm flesh; and fine quality.

Robinson — Rather small, and only deserving of description because so generally planted.

Long as this list is, it barely touches the different classes as they are catalogued by extensive growers. We are in the middle of the plum era. Our wild growing and long neglected sorts, scattered about the states, are now under the eye of scientific collectors, who will sift out the best, and make them the basis of greatly improved sorts.

For a home orchard one may wisely plant, of the European varieties, Bleecker, Bradshaw, Coe's Golden Drop, Grand Duke, Green Gage, Monarch, Orleans, or Magnum Bonum, Peter's Yellow Gage, Pond, Victoria, and Field. Of the Japanese sorts it is difficult as yet to select, because the testing period has not yet decided the hardiness of some varieties. I should at least select Abundance for its value as a pollenizer; Burbank; Chabot; Chalco; Climax; Gold; Gonzales; Maynard; Red June; Shiro; Sultan; Wickson. Mr. Burbank is sure to send us more, and possibly better sorts, every year for sometime to come. It is difficult to select from the native plums a good home list, because our growers have not yet got through with the fresh enthusiasm of collectors

and creators. I think that one may be wise and safe in planting in a small collection De Soto; Forest Garden; Hawkeye; Kieth; Golden Queen; Smith; Stella; Stoddard; Weaver; Wonder; Wyant; Aitken; Cheney; Smith's Red; Surprise; Wayland; Downing; Keoh or Poole's Pride; Milton; and Pottawattamie.

The above list is intended for those who plant plums in orchards. Those who need only a few sorts for home use, allowing the surplus only for market, will do well to plant for succession, Orleans or Magnum Bonum, Bradshaw, Bleecker, Green Gage, Peters' Yellow Gage, Pond, Monarch, Shropshire Damson, Grand Duke. Of the Japanese I should surely plant Burbank, Chabot, Climax, Gold, Red June, and Sultan. Of the natives I should content myself with half a dozen, including perhaps DeSoto, Forest Garden, Kieth, Wonder, Cheney, Surprise, Milton, and Poole's Pride. Where only half a dozen trees can be crowded in, leave out the natives entirely; but never leave out Green Gage, Coe's Golden Drop, Bleecker, and Peters' Yellow Gage — with Shropshire Damson for cooking.

Plum culture in the orchard should be thorough until midsummer; and then cover crops should be used, to be plowed in the next spring. The plum is not a gross feeder; takes to nearly all soils; is neighbourly, requiring little room; and bearing when very young. We can afford to grow plum trees, even if they last only eight or ten years.

Pruning depends on variety. It is impossible to make such varieties as Wickson and Burbank and Bleecker in any way conform to sach other. Wickson pushes its limbs up too close and tight; while Burbank sprawls its limbs too widely open; and Bleecker if left to itself would simply create a thicket. No rule for prun-

ing can therefore guide the grower. He must use his brains. He cannot idealize the trees; he can only control in part their idiosyncracies. Thinning must be done with nearly all varieties, unless it is already done by the curculio. A tree that is left to overbear will give no fruit fit for market, and little for cooking. Some varieties like Abundance, must be picked before ripe, and matured in a dark room. Pollenation is requisite with many varieties; and of course this must be done by other varieties that blossom at the same time. Magnum Bonum is almost fruitless if left to itself; with Abundance as neighbour it bears very heavy crops. Wild Goose pollenizes other plums, but cannot pollenize itself. The orchardist should mix up his varieties in planting.

Plum culture has to meet a few very distinct difficulties beside that of occasional self-sterility. The fruit is frequently affected with ripe rot, turning black on the skin, and being finally covered with little bunches of spores. When the twigs and buds are attacked with the same disease there is an exudation of white gum. The remedy is frequent applications of Bordeaux mixture.

The leaf blight of August and September is generally described as sunburn. The leaves turn brown, and drop from the tree. Frequent applications of Bordeaux are preventative.

Black knot is a fungus growth, often made the shelter or home of larvæ, but not caused by them. The Japanese varieties are very seldom affected by this disease. The more rapid growing Domesticas, such as Bleecker, are generally worse affected. The fungus grows within the tissues, and breaks out into swellings, like huge warts. These are green at first, but black when development is finished. As soon as they are observed apply a sharp knife, excinding them entirely; cutting an inch below the appearance of

the wart, and an inch or more above. You should go over your trees very thoroughly early in the fall; reviewing your work after the leaves fall. The removed tissue should be burned. Where a limb becomes very seriously affected cut it off and burn it. Varieties like Bleecker and Horse plum will sometimes get so covered, and the knot spread so rapidly that it will be better to cut down the tree. It is recommended to paint over a knot, after cutting, with strong kerosene emulsion. Lodeman advises that Bordeaux mixture frequently applied to plum trees has a very marked influence in restraining the development of the black knot.

Sun-scald on the trees is in some sections a very serious matter. This rarely occurs when the plum orchard stands on clay soil; and I have observed it to be far worse in the Western States than in the Eastern. When a tree is affected, carefully cut away the dead bark, to prevent insects and lichens herding beneath. Then paint over the wound. The general remedy is to grow plum trees as slowly as possible, and low-limbed. Shelter the bark as much as possible from the sun.

The hop louse makes its first appearance in spring on plum, buckthorn, and a few other trees. After a few generations it migrates to the hop fields, where it is very destructive. On the plum tree it is almost equally injurious. It is nearly impossible to destroy the myriads. Our best remedy is strong kerosene emulsion, or a strong decoction of quassia chips and whale oil soap. These remedies must be applied just as soon as the lice begin to appear, and must be very persistently used for two or three weeks.

Shot-hole fungus and other fungoid diseases are to be met with Bordeaux.

Our most persistent pest in the plum orchard is the curculio.

This beetle has been at work for a long while, and our fathers knew of no way to combat it except by jarring the trees. We have learned to improve on this method by jarring over large sheets, spread beneath. Use a rammer, eight or ten feet long, well padded at the end; strike the tree suddenly two or three times; when the beetles will fall on to the sheets, and can be caught and crushed. It needs prompt action, for the beetle will fly away very soon. Jar your trees twice a day, for about two weeks. Begin this work just as soon as the petals drop from the fruit. Where you are growing but one or two garden trees, you may follow the jarring, by cutting out the egg of the beetle, with the point of a pen-knife. This can be done very easily before the larvæ hatch; and you may save a large amount of stung fruit. The slight wound will heal over, and not appear on the ripened fruit.

The tent caterpillar sometimes flows over from the apple trees, on to the plum trees. Collect the egg masses from the ends of twigs, when the foliage is off the trees. When a nest hatches, burn it out immediately with a kerosene torch.

Canker worms sometimes appear in great numbers, and make havoc with the young foliage. They are small caterpillars, appearing on the trees with the opening leaves. They can be jarred suddenly from the trees; and prevented from returning by bands of sticky cotton bound about the trees. The female moth is wingless, and can ascend the tree only by climbing. Spray the trees thoroughly with arsenical poisons. Bud moths and nearly all other insects that attack the plum can be destroyed in the same manner.

The peach tree borer often attacks the plum tree, and can be fought, most effectively, by keeping the bark clean; and where the trouble is quite serious, wash the trunks with strong kerosene

emulsion, frequently. The borers must be dug out with sharp knife and flexible wire.

While some of the above named enemies of the plum are at times very troublesome, there really is but one that has to be persistently and regularly fought, that is the curculio. Birds do not care for plums as a rule. There is however a marked exception to be made in the case of the Japanese and the Japanese hybrids — which are often attacked by the orioles. These birds have the evil habit of picking holes into plums, pears and grapes, in order to suck a drop of juice, without eating the whole fruit. Bees and hornets follow and the crop is quickly destroyed. Cover your trees with mosquito netting; or better yet, pick as fast as the fruit colours — to ripen indoors.

As a domestic fruit the plum stands very high, not only for dessert, but for cooking and canning. Nearly all housekeepers desire to have a good supply of currants, berries and plums. A few trees can be crowded into corners, where other fruit trees would not find room, or would become the prey of insects. In city yards the plum is an ideal fruit tree. All through the Mohawk valley, from Albany to Syracuse the cities produce for themselves nearly a full home supply — mostly of Bleeckers. In back yards and front yards this plum is seen in July and August, everywhere overloaded with superb fruit. It is the poor man's tree, rising out of pinched yards, and hanging over ash heaps and wash tubs. In our villages also I find this plum squeezing its way between buildings and in the rear of stores, but always fruitful.

CHERRIES COVERED WITH NET HANG ON THE TREES FOR TWO MONTHS

BLACK TARTARIAN

CHAPTER SIX

THE CHERRY

To discuss the cherry is most grateful to all admirers of fruit growing. In blossom the tree is an ideal, worthy the adoration given it by the Japanese. In fruit the beauty of the tree is notably conspicuous. Grown in rows, nothing is finer for an ornamental windbreak, as they may stand very near each other, without largely decreasing the quality and quantity of the fruit. A well grown tree of the sour varieties will be at maturity about fifteen feet in the diameter of its limbs; but it will blossom when only two or three feet high, and will bear fruit through the whole period of its growth. I recommend cherry trees all around a small homestead, flanking the fences or boundary lines, as a windbreak.

The sour cherries adapt themselves readily to almost all soils, but they prefer clay. They will thrive even in damp places, with only a surface drainage. On sandy soils the growth is generally too rapid, and the bark cracks. Only one exception must be made very positively as to position; the cherry tree must not be on the shaded side of the house, or it will be infected with black lice. In fact the cherry tree likes sunshine.

The sweet cherries must be set farther apart — about twenty-five feet, for such varieties as Gov. Wood; and thirty feet for such as Black Tartarian. In the orchard they should be well cultivated

until July or August, and then a cover crop be sown for winter. Where trees are scattered they should be kept well mulched, with coal ashes or with litter. This question of mulch, important always, is specially important with cherry trees.

To prevent bark-bursting and sun-scald, plant, as far as possible, in claysoil; and do not stimulate the trees to make rapid growth. In other words do not enrich the soil too highly; and at the same time keep the limbs headed low, to shade the trunk of the tree. This rule which I hold to be universal for fruit trees, and only to be suspended in orchards that are to be plowed, is peculiarly essential with cherry trees.

There are four classes of cherries in the United States. Of Prunus avium we get the Mazzards, growing wild, and bearing a fruit of many different hues and shapes. This stock is very hardy, and is used for grafting the more delicate sorts. In the same class as the Mazzards are the Heart or heart-shaped sweet cherries, either light or dark in colour; the Bigarreaus, also heart-shaped, but firmer-fleshed than the former: and the Dukes, which bear cherries nearly as sour as the common Morellos. It is among the Hearts that we find Black Tartarian and Gov. Wood; among the Bigarreaus are Napoleon and Windsor; and among the Dukes are May Duke and Reine Hortense. All of these varieties rank among the very best for home culture and for market. From Prunus cerasus we get the Amarelles, including Early Richmond and Montmorency. In the same section we find the dark-coloured sour cherries, Morello and Louis Philippe. Sour cherries in the nurseries, are grafted either on Mazzard or on Mahaleb stock; and sweet cherries are almost always grafted on the Mazzard.

Sour cherries may be made to cover a very long season, begin-

ning with June and lasting as late as October. This is done by covering several trees with mosquito netting, so that the birds can be shut off. Cherries covered in this way hang on the trees for two months; growing sweeter all the time. Those who have only tasted the market cherry would hardly recognize a Morello or Montmorency, after it had been netted for six weeks. This method is particularly recommended where cherries are grown for home use, or for private customers. The cost of the netting, for a single tree, is perhaps a full dollar or more; but if carefully handled, and removed as soon as the cherries are picked, it will serve for three years. This makes the annual cost about thirty-five cents. I have sold six dollars worth of fruit from a single Morello tree, in one season. If however, people generally will plant cherry trees, and do it as freely as our fathers, the birds will have enough, without seriously encroaching upon the crop. There are other ways of considerably lengthening the cherry season. Begin with the Early Richmond, or with the Dyehouse, which is even earlier than the Richmond, but not so good; follow with the Baldwin; then the Morello; planting also freely of the Montmorency; and you will have sour cherries in the process of ripening for over two months; and if covered they will be in good condition for four months. Sweet cherries must be carefully tested, to determine the best for your locality and soil. In central New York I find Gov. Wood, Windsor, Rockport Bigarreau, and Napoleon Bigarreau to be an excellent list of reds and light coloured varieties, while Black Tartarian is the king of the blacks. May Duke sometimes loses its blossom buds by late frosts, but is the best of the Duke cherries for general planting. In California, where the cherry industry is very general and exceedingly profitable, the varieties most com-

monly planted are the Early Purple Guinne, and Knight's Early Black. In the Northwest, cherry planting is confined entirely to the sour varieties. It seems possible, however, that we have in the Dikeman a variety which will widen the sweet cherry belt very decidedly. It orignated in Northern Michigan, and is exceedingly hardy. The original tree is of immense size, and still producing large crops. The fruit is large, black, firm, of excellent quality; a fine keeper and shipper. It is not improbable that, with proper effort, we shall be able to create a list of sweet cherries that will thrive and be productive in Iowa and Wisconsin.

The following list includes the best established of the cherries in their separate classes. At the head of the list of the Heart cherries we may place:

Black Tartarian — Of superb quality, and nearly black in colour; juicy, rich, and beautiful. The tree is remarkably vigorous and an immense bearer. It ripens through July.

Black Eagle — Another large, black cherry of very fine quality; but the tree is a moderate grower. The fruit ripens in July, a little later than the Tartarian.

Coe's Transparent — Tender and sweet, and one of the very best in quality. The tree is vigorous in growth, and the crop is ripened in June.

Elton — A very large, pale yellow cherry, flushed with red; of most delicious flavour; and ripening the latter part of June. The tree is an irregular grower, but very vigorous.

Gov. Wood — This has long been held to be the standard of quality among the sweet cherries. The fruit buds are quite hardy, and the tree is a stout, healthy, vigorous grower, and an abundant

producer. It does not rot easily, and hangs well on the tree — ripening about the first of July.

Knight's Early — This is a large black variety, of excellent quality, ripening the last of June.

Among the Bigarreau cherries we find most commonly planted, and generally most popular:

Kirtland's Mary — One of the finest cherries in the list, although it is not in general cultivation. It recalls the skill of that cherry enthusiast, Kirtland; and was one of his favourite productions. It is a red fruit, of high flavour, sweet and juicy.

Napoleon — A truly magnificent cherry, both in size and in quality. It is pale yellow, with a red cheek. It grows on a vigorous tree that it is capable of bearing enormous crops. It ripens in July.

Rockport — This is another Bigarreau of superb quality — very large, pale amber, touched with red in the sun. The tree is vigorous and beautiful in growth, and ripens its fruit about the first of July.

Windsor — A recent candidate for favour, of very remarkable qualities. Its flesh is very firm, while the hue is very distinct — being liver-coloured. It ripens quite late in July. As a Canada seedling, it is recommended for the hardiness of the tree and fruit buds.

Yellow Spanish — An early ripening sort; pale yellow and most delicious. The tree grows vigorously and is productive.

To these Bigarreaus we ought to add the Bing, a huge dark red, and the Lambert, a mammoth reddish black cherry. The Lake, the Flinn, and the Republican are also extremely large and very attractive.

Among the Duke and Morello, or sour cherries, we have those best adapted to very small grounds, and to cold climates. A good list would include.

Baldwin — A new candidate for favour among cherries of the Morello type. It is said to be the sweetest and richest in that class. The tree is a fine upright grower, remarkable for its productiveness, and very hardy. The fruit is one of the earliest to ripen.

Early Richmond — Differing very little from the common Morello, except that it is somewhat smaller in size, and ripens two weeks earlier. The tree is a free grower, and fairly productive. It is a good variety to grow on dwarf stock.

Empress Eugenie — Is another large dark red, and very rich fruit, growing on a robust and productive tree, and ripening in July.

Late Duke — This is a large light red cherry, ripening in July; of excellent quality.

May Duke — This is one of the noblest cherries that we have. The tree is very vigorous, erect, and will reach a height of twenty-five feet; it is also very nearly as hardy as the Morello. The fruit is subacid and rich in quality; dark red and ripens about the middle of June.

Montmorency — There are several varieties under this name. The ordinary sort is quite similar to early Richmond, but ripens later; while the large-fruited is not only to be preferred for its size, but for its attractive appearance. It ripens about the last of June.

Olivet — This variety is recommended for its tender and vinous quality; being very sweet or subacid. It ripens the middle of June, and hangs well to the tree to the last of July.

Reine Hortense — Is a large, bright red and juicy cherry, of French origin. It is nearly sweet, and of the very finest flavour. The tree is vigorous and bears immense crops.

Royal Duke — Another of the Duke class that can be recommended in the strongest terms; ripening its fruit a little later than May Duke.

Among recent additions to our list we must note Allen; nearly heart-shaped, very large, and nearly black when dead ripe — a sweet cherry said to be almost entirely free from rot; ripening in July. It will probably be adapted to a very wide range of territory. It will be well to try this new sort, not only where other sweet cherries succeed, but also where they are not an eminent success. Lutovka is a Russian cherry of the Morello type. The fruit is firm and of good quality. I find it quite slow in coming into bearing, and there is little to recommend it as a rival for our best sour cherries. Ostheimer is a perfectly hardy, late-blooming, and immensely productive sort, bearing large and heart-shaped fruit, of a black colour. The quality is very good, and the variety is to be looked after because of its ripening in August. Schmidt is not altogether a new sort, but not generally disseminated. It is of immense size, and of the finest quality. It ripens in July. Vladimir is another Russian sort, very handy and very prolific. The fruit is no larger than Early Richmond, and the quality of the fruit, while good is not superior. It ripens in July. Wragg is a very late ripening sort, vigorous and productive, of medium size and of excellent quality.

The cherry must be picked with great care, if it is to be carried to market. Not one cherry must be detached from the stem, for the juice will stimulate rotting, besides gathering dust. For market

they are generally packed in baskets, holding from five to eight pounds.

The diseases which affect the cherry, beside the black knot, are a leaf blight, and powdery mildew. The remedy is Bordeaux mixture, applied before the buds open, and afterward two or three times. In some sections there is a brown rot which attacks the fruit during hot weather; and sometimes even the flowers and the leaves. Fungicides must be used — generally Bordeaux mixture. Where trees are shaded the black aphis is exceedingly troublesome on the young shoots; followed by an exudation of honey-dew. Sweet cherries have of late years been very seriously affected with green aphis, in such immense numbers as to thwart the most vigilant efforts to subdue them. The leaves curl upward and roll in, shielding the lice from the fungicide. The best remedy is kerosene emulsion, about one part to six parts of water, and applied very early and frequently. Another remedy which has been found to be effective is four pounds of quassia leaves with three or four pounds of whale oil soap, in fifteen or twenty gallons of water. The soap must be boiled until it can be strained, so as not to clog the nozzle. Doing our best we shall still find the cherry louse very hard to subdue. I think the key to success lies in beginning our work very early, and doing it very thoroughly. The plum curculio also stings the cherry — especially where plums are scarce. The remedy is the same as in the case of the plum. Jar the trees twice a day with padded rammers, over sheets. The curculio will pretend to be dead as he falls on the sheet, and can then be seized and crushed.

Although the cherry tree takes well to almost any good land, it will respond to good culture and manures, with heavier crops

and richer foliage. However, it is not advisable to stimulate the growth very greatly. In a commercial orchard the trees are generally grown low-limbed, and what is called vase formed. Plow your orchard lightly, and run your cultivator until the first of July; after that put in your cover crop, which is to be plowed under in the spring.

The cherry can be top-grafted, working over varieties which are hardy in tree, but tender in bud, to varieties more sure to yield fruit. In doing this the limbs chosen for grafting should be high up in the tree, so as not to be overshadowed by the rest of the tree. As a rule it will not be wise to graft limbs that are more than an inch and a half in diameter.

CHAPTER SEVEN

THE QUINCE

THE wonder of horticulture is that the quince has remained so long just a quince. In fact it is less of a dessert fruit than it was in the days of Henry VIII. Yet as a baked dish it is unsurpassed. Cut it open while still hot, spread with butter and sugar, and you will have a dish that you will never forget. The quince is always in demand, but this demand does not seem to rapidly increase.

The best variety that I have tested, including size, colour, hardiness and ability to keep, is the Pear quince. This is by no means the popular verdict, for the Pear quince is neither as large nor as showy as the Orange, or Apple, quince. But I have grown quinces all my life, and knew it well in my father's orchards as long ago as 1840. The Orange or Apple quince should be grown in the bush form, with perhaps three or four limbs coming directly from the ground. The fruit is large, and ripens in September. The Pear quince is later to ripen, and is generally picked before it is quite prepared to leave the tree. I find that this variety does well in the tree form.

The list of quinces generally catalogued includes the Champion; The Meech; the Missouri Mammoth; the Orange, or Apple; the Pear; the Rea, or Rea's Mammoth. To these must be added two recent varieties called the Fuller and the Van Deman. The very

latest claimant to favour is a production of Mr. Burbank of California. This new quince is represented to be a really good dessert fruit — the first quince that could be eaten out of hand. Unfortunately, this variety, which he calls the Pineapple, has not proved to be hardy enough for our Northern States. Possibly the failure is owing to the fact that only small trees can yet be obtained. All of our shrubs and trees are more tender when quite young, and this is notably true of the quince.

The Rea quince is a seedling of the Orange, averaging a good deal larger in size; of the same form and colour, and about the same quality. The Meech is a vigorous grower, and immensely productive. The fruit is large and very handsome. Some people think they distinguish a richer fragrance from this variety. The Champion averages somewhat larger than the Orange, the quality about the same, and reported by some to be a longer keeper. In my own experience the Orange quince, when handled with great care, will keep till January, while the Pear quince will keep in good condition all winter.

Two foreign varieties are the Angers and the Bourgeat; the former very little cultivated, and said to be hardly equal in quality to our best varieties; while the Bourgeat is of the finest quality, and a very handsome fruit. The latter is winning its way into favour because of its strong growth and immense crops. It bears well at three and four years of age.

The propagation of the quince is by cuttings, by layers, by division, or by root grafting and budding. The easiest method for the fruit grower is to take the suckers of this year's growth, cut them smoothly into slips eight inches in length; thrust these into nicely prepared beds, inserting two-thirds of their length, and

then pressing the soil down tightly. These cuttings will very readily take root, and most of them will afford young plants, ready to be transplanted one year after setting. Propagation by layers is simple, but hardly necessary while it can be done so much more easily by cuttings. In a quince orchard every abraded root will make shoots, and form a new bush, if permitted. Many of these can be removed for use. Root grafting is practised in the nurseries, and does not differ from the root grafting of other fruit trees.

The quince likes clay soil, and has found its natural home in the retentive clays of New York state — especially in the centre of the state, where the tree is very healthy, and the fruit clean of scab. It is grown enormously in the western part of the state. The orchard should stand on high soil, and be well drained. The quince will not endure standing in wet land. The trees should be kept fairly well open to the sun; either in the tree form, or in the bush form. New shoots are always coming, and, if left to themselves, will soon render the bush unprofitable. Trimming must be attended to with accuracy, removing all superfluous shoots from the base of the bush or tree, and from the limbs. Whatever form you give the quince, its growth is slow, but it comes to bearing in about four years from small plants; and to heavy crops in eight or nine years. I lost every tree in my orchard in 1895. In 1897 I had replanted, and in 1904 the trees were full of fruit, in spite of the severity of the preceding winter. As fruit blossoms appear on new wood, the quince crop is not as likely to be destroyed by a hard winter as if they appeared on old wood. I have seen the trees killed back on all their limbs, and yet give a good crop.

The most common diseases to which the quince is subject are

the "pear blight;" and a rust that affects both leaf and fruit. The blighted parts should be promptly removed; cutting some little ways below the apparently affected part, and then burned. The remedy for rust is Bordeaux mixture, applied before the buds break in the spring, and at intervals of ten days thereafter, for three or four applications. The quince borer is the same as the apple tree borer, and must be dealt with after the manner prescribed for the apple tree. Use a flexible wire, and use it promptly. I have seen very rapid destruction of quince orchards by the borer, when allowed to have its way undisturbed. The fruit of the quince is sometimes affected by the codlin moth; and it must be treated with arsenical poison, at the same time that apples and pears are treated.

CHAPTER EIGHT

THE PEACH

THE Connecticut farmers, as they pioneered westward, carried with them small seedling trees, not only of the apple and the cherry, but of the peach. The fruit from these seedlings was small, tough, and hardly digestible in the raw state. Yet it was considered a wonderful fruit for that day — early in the nineteenth century. Since that, new varieties have been rapidly multiplied, and large peach sections have been developed. A few years ago Mr. Hale of Glastonbury, Connecticut, found that the Chesapeake peach belt run all the way up to, and along Long Island Sound. Since the Civil War, Georgia and Alabama, compelled to look out for new industries, have developed a remarkable peach section, covering the northern third of those states. Missouri, Texas, and Kansas constitute another southern area, which is peculiarly fitted for the peach. But for free and abounding harvests of this delicious fruit, California and the Pacific Coast surpass all the rest of the country. Michigan, Ohio, and Western New York, near the Lake system, extend the supply in our markets into September and October.

We are now hunting for the hardy peach that will give a good fruit, over a much wider area. There are good pomologists earnestly at work on this problem, and we shall surely have thoroughly hardy peaches for New England, and Northern New York, and

Canada. Each year sends out new aspirants for this position, and among those already accumulated we have such as will endure many of our Northern winters. Not living in a natural peach section, I am still able to count with considerable certainty upon the Crosby, Waddell, Champion, and Carman to give me crops with some regularity. It is claimed that Wright, Russell, Woolsey and Alton are of the very hardiest. In my orchard I have under test thirty or forty varieties; and welcome severe winters, because they eliminate the weakest.

Those who live in sections too cold for the orchard peach, may grow them in peach houses with decided success and little cost. The only object is to shelter them during the winter, and this may be done in very simple lean-to buildings, with or without glass as may be preferred. If without glass, there must be a frame, over which may be spread some winter protection. A still better way for people in general is to plant a few peach trees in pots or boxes. These must be housed or shedded in winter. Bear in mind that the peach tree itself is but little more tender than the plum tree. It is the fruit bud which nature has failed, as yet, to prepare with sufficient covering to carry it through a freeze much below zero. Trees grown in pots will begin to bear when they are two or three years old. They must be kept well cut back, and carefully trimmed. Give them sufficient protection to keep the thermometer above zero. I have found this difficulty with peaches grown in a house, that if too densely shaded, the fruit would lose flavour, or even become positively bitter. At very slight expense a lean-to can be built against the barn, preferably with an eastern or southern outlook, in which half a dozen trees may be grown; yielding a very good supply of peaches for a small family.

For outdoor growing of choice peaches, as far north as Wisconsin and Iowa, several plans have been suggested. Either cut off the uprights, and induce the limbs to spread low to the ground — keeping them flat in their spread; or in the autumn, after the leaves have fallen, cut the roots on one side, dig out the soil, and bend over the tree so that it may be covered for the winter. The latter plan will work fairly well for young trees; but I have found a strong probability of rotting the fruit buds, or otherwise damaging the twigs. The peach crop is so abundant as a rule, and market supplies are so cheap, that very few will consider a large amount of labour and expense warranted on this sort of orchard culture. I am willing, however, to experiment, and be satisfied with rather meagre results in order to have home-grown peaches. No peach from market basket ever has the complete orchard flavour.

Mr. McComber, of Wisconsin, tells us that he has settled down to the plan of selecting young trees, preferably seedlings, from seed planted where trees are desired. "Train the trunk horizontally, eight to ten inches from the ground, and suffer no branches to grow. The trunk is kept tied loosely to a slender pole. When trained in this way, the tree will continue to grow until frost stops it; therefore the breaking off of branches must stop a few weeks before frost, so that the wood at the end of the trunk will be ripe enough to stand the winter." To protect the tree the first winter use half-inch boards, about three inches wide; and nail their edges together, so that they will make a wooden eve-trough. Remove the pole, and put a few shovelfuls of earth around the roots, and evergreen branches over the trunk and trough, and under the trunk. If the tree is in good soil, and well cultivated, it will in

THINNING IS PRACTISED VERY THOROUGHLY BY EXTENSIVE GROWERS

ELBERTA — THIS VARIETY IS QUITE POPULAR

a few years make a trunk ten to fifteen feet long. Now, while keeping the trunk horizontal, allow the end to grow up and form a head. This is tied to a stout stake, as it grows. When freezing weather comes, the head is bent over, and laid on evergreens, and other evergreens are placed on top. From this time the treatment of the tree is the same as that of any other fruit tree, except the covering in the fall. Mr. McComber tells us that trees bear as abundantly as when grown upright from the stub. The plan is interesting for those who are willing to bestow the necessary labour and care.

A peach orchard should face the north rather than the south. I have seen fine crops, picked annually, from trees growing in the most exposed and highest land of southern Michigan, while my own trees, in an apparently more favourable position, gave me crops but once in three years on the average. All fruit trees are liable to sun-scald in the winter. In a very sunny, cosy nook, where at a glance one would suppose any fruit would nestle and thrive, the trees will soon be blistered on the south side. These blistered sides will crack and become the homes of vermin. This general fact is equally true of most of our hardy forest trees. If an orchard must be placed in such a location, let the limbs come out low down to protect the bark. In a few cases I have boxed the trunks of pear trees and peach trees, to prevent them from successive thawing and freezing.

For planting select trees that are headed low — a rule almost universally to be followed in selecting fruit trees; head back at once, and sharply; encouraging the formation of a round head. After planting, go over the orchard every second week, and rub out all useless sprouts. Select carefully for preservation those

shoots that will keep the head of the tree open to the sun and air. Let no suckers have a showing for any length of time. If handled promptly, this work can be done with the thumb nail. However, I recommend the use of a fine-bladed knife, cutting close into the wood. The fruit grower needs not only a pruning-knife of the ordinary sort, but a pocket-knife of the best tempered steel in which the small blades can be used for such work as I am describing.

When winter approaches, and all growth is stopped, head back your young trees, from one-half to three-quarters — in all cases leaving the last bud pointing outwards. Cut again the second winter, removing from one-fourth to one-half of the new growth. Repeat this pruning as long as the tree is reachable. When you cannot go over it with a step-ladder, it is time to cut back the whole top, and form a new head. In my own case, mainly testing peaches to determine hardiness, I do not cut back the heads even when quite tall, because I grow them between other trees, and must economize space.

In the orchard, set trees about twenty feet apart, and cultivate them thoroughly. This cultivation should go on until about the last of July or August; then sow a cover crop — that is a crop to protect the roots during the winter, and to be plowed under for humus and nutriment, in the spring. The cover crop for peaches needs no description; it is the same as that for apples and pears. For early crops it is best to plant beans or peas, because these can be plowed under if desired; or if a crop is taken, there is still nitrogen added to the soil by the roots. I think, however, that the common method is to plant potatoes and tomatoes, at least in southern peach orchards, using phosphoric acid in the form of bone; with carbonate or muriate of potash. The cover crop, if plowed under each spring,

will supply sufficient nitrogen. Be careful about using a large amount of raw barnyard manure in the peach orchard. All barnyard manures should be first composted with ashes, and other material, until well decomposed.

Probably our best-flavoured peaches come from Georgia. Mr. Hale has orchards in that state of one hundred thousand trees. Other orchards even larger than these are being planted in Missouri and Kansas. The favourite sorts in Georgia are Elberta, Carmen, Greensboro, Hieley, Waddell, Rose, Belle of Georgia, and Stump the World. The Chinese stock is best for the lower South, especially for Florida. In Missouri Mr. Stark specially recommends Elberta seedlings — very similar to the parent, but often improved; the Alton, Champion, Admiral Dewey, Grady, Frances and Captain Ede.

Thinning the fruit of peach trees is practised very thoroughly by extensive growers. This is essential to good competitive crops. In market what wins profit is colour and size, every time — unless in the case of some well known fruit, of extraordinary flavour, like the Seckel pear. This must never be forgotten by the orchardist; for even the Seckel is losing its hold in favour of larger and more showy pears, like Sheldon and Anjou. With peaches perfect flavour can be got only with a perfect sample of fruit.

The peach has specific and very serious enemies — not only in the insect line, but in the way of fungoid diseases. The worst of these is the Yellows. This attacks peach trees apparently without any reason, in the fullness of their vigour, quite as surely as when old and unthrifty. It is a communicable disease, probably transferred by human means. It certainly does not go through the air. It is characterized by yellowish leaves at the tips of the shoots.

The fruit of diseased trees is marked by spots and red lines underneath. Such peaches ripen prematurely, and are small and inferior. The end of this disease will be the ruin of the tree, in the course of two or three years.

The curculio must be dealt with as in the plum orchard. As soon as the blossoms drop, the weevil or mature insect lays its eggs in the fruit; and when the grub hatches, it quickly eats its way to the stone, when the peach falls to the ground. Spread a large sheet, covering the ground beneath the tree, and jar the trunk until the insects fall. They must be seized very quickly and disposed of. The curculio for the last few years has greatly decreased in some sections, where it has been troublesome for sixty years.

The peach tree borer works near the surface of the ground, and its operations are precisely as in the apple and quince. The eggs are laid in the summer, and the larvæ are at work in the late autumn. It is best to examine the trees two or three times a year. Those that are not caught and destroyed in September may be at work all winter, and should be sought out in the spring. Use a flexible wire, and do not hesitate, in serious cases, to use a sharp knife. Climbing cut worms do a great deal of damage in young orchards. They are not easy to get at because they work in the night. Your best remedy will be to make a ring in the earth about the young trees, and put in a mixture of Paris green with molasses.

North of the peach sections do not undertake to grow late-ripening varieties, like the Elberta. It is a curious complaint to make of a peach that it bears too freely, yet this is really the case with the Crosby. It is a hardy variety, but it is sure to be overloaded with fruit; and if you do not remove at least half of this, the quality will be decidedly inferior. It is not easy to tell why, and yet

you will find peach orchards dying out on some soils, while other orchards are doing admirably within half a mile. Those growing on high ridges stand the best chances.

Fruit rot is not a natural process of decay, but is due to a fungus. Some varieties of peaches are much more subject than others to this disease. It is recommended to spray with a solution of one pound of copper sulphate to twenty-five gallons of water. As soon as fruit buds begin to swell the peach orchard should be thoroughly sprayed with Bordeaux mixture. It may be advisable to repeat this spraying two or three times. During the ripening period the spray should be used, if rot or twig blight appears.

A full list of varieties offered by our leading nurserymen is quite unnecessary. Among the varieties most generally planted the following list will include the most important.

Alton — A very large peach, white fleshed, of the highest quality, and a free-stone. The tree is among the hardiest both in the wood and the bud. I find it promising at my home at Clinton, N. Y.

Banner — A variety that originated in Canada, and ranks among the very hardiest in wood and bud. The flesh is yellow, of excellent quality; and we have very few better shippers.

Belle of Georgia — One of the great market peaches of the South. Flesh white, red at the pit, and very juicy — a free-stone. Sometimes called the White Elberta; ripens just before that variety.

Bequett Free — This has come into great favour in the Southwest, as one of the best for home use or market. The fruit averages very large, and is a perfect free-stone. The flesh is white, juicy, and firm.

Carman — A remarkable peach everyway. I can confidently recommend it for planting outside the peach belt, where it ranks among the nearly hardy sorts. The flesh is creamy white, rich, juicy, and a free-stone.

Champion — One of the hardiest and best peaches in existence. The flesh is white, sweet, rich and juicy — a perfect free-stone. It ripens a little after Waddell and Carmen.

Crawford — Crawford Early and Crawford Late are probably the best known peaches in the United States. They do not need description, because found in every market where peaches are known. Crawford Early is an early September, very large, rich yellow, free-stone; and Crawford Late is very much like it, but ripening two or three weeks later.

Crosby — Of recent origin, and ranks among the hardiest. It is inclined to overbear, and, if allowed to do so, the quality is inferior. Flesh yellow, and of fair quality when at its best.

Crothers — A new variety, said to be worthy of a place among the best peaches of the country. The flesh is a creamy white, very juicy, and very rich — a free-stone.

Elberta — This peach originated in Georgia, a few years ago, and is now one of the most commonly grown all over the United States. The fruit is of large size, with golden yellow skin, covered largely with crimson. The flesh is yellow and very juicy, but in quality it cannot take rank with such peaches as Champion and Triumph. It bears transportation unusually well. Seedlings of Elberta are claiming special attention in the Southwest. It seems to be a variety, something like the Crawford, which will produce seedlings like the parent, or improved.

Fitzgerald — This was introduced from Canada, and was said

to be very hardy, both in tree and in bloom. I have not been able as yet to get fruit from it in Central New York. The flesh is a deep yellow, and of very high quality.

Foster — A large yellow peach, of the Crawford stock, and very high quality. It ripens about with Crawford Early.

Frances — A peach highly approved in the South, for shipment just after Elberta; and held to be a better shipper than that variety. The flesh is yellow, very firm and solid, and excellent.

Grady — A thoroughly noble peach — a yellow free-stone, ripening early; very large and handsome.

Greensboro — Among the very early peaches this is one of the largest, most beautiful, and best shippers. Quite hardy. Flesh white, tender, and juicy; and not subject to rot.

Klondike — A new peach of the greatest beauty, and highest quality. Said to be the largest of all white free-stone peaches.The tree is very robust in growth, and very productive. Flesh white, sweet and juicy.

Matthew's Beauty — Is held in the South to be a good rival of Elberta, and ripens three weeks later. The flesh is firm, and of excellent flavour, a free-stone. It is of no use in the North.

Morris White — Another of the old line peaches which still hold place in the orchard. The tree is a moderate grower, long lived, and bears a good crop; of only medium size; the fruit is creamy white, and sometimes tinged with red; flesh pure white and fine.

Mountain Rose — An old variety, very early, quite hardy, and very good. The skin is whitish and nearly covered with dark red. The flesh is white, and a free-stone.

Russell — This and Wright are two new peaches from Nebraska.

They are said to be the hardiest of all good peaches. The flesh of both is white, and both are free-stones. They are well worthy of a place in testing orchards.

Pres. Lyon — A new variety, and very much resembles the late Crawford; but a better peach. The tree is very hardy, a good grower, and the fruit is uniformly large, yellow fleshed, and of the highest quality.

Salway — This variety is still quite popular, although ripening very late for Northern orchards. It has the peculiarity that it can be picked when very green, and will ripen in storage.

Sneed — Very early, and a semi-cling. Flesh white, and juicy. One of the very best of the very earliest sorts.

Snow — An old peach, but still a good one to plant in the North. I find it very hardy, while the quality is delicious.

Triumph — One of the most popular of the new peaches, a free-stone, ripening very early. Very large, and of a deep rich yellow flesh. The golden skin is nearly covered with red.

Victor — Another very early peach, ripening even before Sneed. The tree is a fine grower, and an immense bearer of peaches with a subacid flavour, and greenish white colour.

Waddell — I consider this one of the most promising peaches for Northern planting. It is hardy in bud, while the flesh is white, very firm, very sweet, and very rich. The peach hangs well on the tree, and keeps well after being picked.

This list could be very greatly lengthened, and would still include many varieties highly prized in some sections of the country; such as Longhurst, Levy Late, Capt. Ede, Edgemont Beauty, Bonanza, Mammoth Heath Cling, Red Bird Cling, Gold Mine — every one peaches of very high rank and quality.

Nectarine — The nectarine is nothing more than a highly differentiated peach. Its separate classification can hardly be retained. It is simply a peach with a smooth skin. It frequently is produced from the seed of peaches, and in return peaches are produced from seeds of the nectarine. Budd tells us that he saw tons of the fruit, both in the fresh and the dried form, at the great commercial fair of Nishni Novgorod. It was brought in by the merchants of Central Asia, who reported that it had been a commercial product since the Fair was started, four hundred years ago. It will do no harm to still call it the nectarine; and out of it may be developed a farther differentiation of value. Regel says of these Central Asia nectarines "The smooth skinned nectarines of this region, among which are the smaller yellow varieties, and very large red-cheeked ones, are of unusually fine flavour and melting flesh; but they are equalled by the nectarines of Samarcand. There are also small, sweet, yellow kinds, which stand half way between the rough-coated and the smooth-coated peaches. These grow in the exposed region of Vaendsh."

The nectarine is propagated in every way like the peach. Its smooth skin subjects it to more danger from the curculio, and other insects. The tree is about equally hardy with the common peaches, but it is seldom grown in the Northern States. In great peach centres, and in California it is grown for canning and for drying. We find it for sale in the New York markets, and in a few other large cities; but it enters very little into commercial rating. Wickson reports that the production of nectarines for drying is only about one per cent that of the peach. The varieties most commonly grown in this country are Boston, Downton, Early Newington, Pitmaston Orange, Humboldt, Lord Napier, Elruge.

CHAPTER NINE

THE APRICOT

THE apricot is another relative of the apple, but a closer relative of the plum and the peach — half way between the two. It is generally supposed to be a good deal less hardy than the plum, but some varieties of the apricot can be grown wherever the majority of the plums are hardy. It also thrives along side the peach. The apricot is supposed to have originated in China, but came into the flora of Europe many centuries ago. In the United States it has not been an orchard fruit for more than fifty years. The tree very much resembles the peach in growth, and it has the same enemies. The fruit has, however, to be more specifically protected against the plum curculio. Insects know good fruit, and are specially fond of the apricot. It is useless to plant it unless you intend to take good care both of the tree and the product. The borer must be kept out of the tree, as I have directed for the apple and the peach; and the curculio must be caught by jarring on sheets. I have not had such success with even the hardiest apricots that I can commend any general planting of the trees in the Eastern States. The soil most favoured by the trees is sandy, or gravelly, and well enriched on the surface. Beware of barnyard manures about the roots. Nearly all good apple-orchard soil is suitable for both plum and apricot; but in all cases the ground must be well

drained. I believe it is understood with apricot growers that an orchard thrives better on high land, near a body of water. Clean culture is recommended in all cases, and cover crops for the winter.

The Russian apricot is a hardier development, by selection and environment, of the common European sort. The fruit is hardier; but it is also smaller and inferior. The so-called Japan apricot is grown only for its blossoms. I imagine we have not more than begun the improvement of this first; and are destined to as great an evolution as in the case of the plum.

At present it is mostly desired in small and fancy packages, and need not be offered, in even the largest markets, by the bushel. In California it enters commerce largely as a dried or evaporated product. It is grown in the smaller valleys with great success; when it is generally grafted on the peach root, because the natural root is a favourite food for rodents. The fruit is graded according to size, both for canning and for drying. For drying the fruit is cut into halves, dropping out the pits, after which the halves are laid upon light wooden trays. When the trays are covered they are subjected to the fumes of burning sulphur, to make sure of a light golden colour. After this exposure the fruit is cured in the sun. It requires six pounds of fresh apricots to make one pound of evaporated or dried.

The apricot is said to yield about seven and one half tons to the acre. The varieties most in use in California are the large Early and Early Golden, beside a seedling called the Pringle, and another called the Newcastle. Blenheim and Hemskirk are recommended for late varieties; also the Moorpark and the Peach are much in favour. In our Eastern orchards we are planting the

Harris, the Moorpark and the Royal most freely. Those who are satisfied with Russian stock generally plant Gibb, Budd, Nicholas and Alexander. Mr. Stark of Missouri has sent me two which he calls the Sunrise and the Superb, recommending them as decidedly superior to all other varieties, considering quality and prolific bearing. The Superb is recommended as the one very best apricot, resulting from careful selection of seedlings.

The apricot is a very rapid and rampant grower. As a consequence orchardists have adopted a system of shortening in annually. This is in part to secure low-branching, and in part to relieve the tree from an excess of bearing-wood. It has also the advantage of thinning the fruit, and securing larger individual samples. In colder sections this sort of pruning is not so much needed. In our Eastern States about all the direction that is necessary for pruning the apricot is to adopt the same general plan as with the plum.

CHAPTER TEN

THE GRAPE

THE grape is a winning fruit. It has been associated with poetry and prose for over three thousand years. It was one of the earliest fruits to perfect itself; the clusters of Palestine, a foot long, are still our envy. It is peculiarly cosmopolitan, being found, in some of its varieties, all over the globe. It is used not only as dessert, but for wine and for raisins; and so in some form has entered into commerce very extensively from the first stages of civilization. In this country the grape is mainly used for food. Our production of wine, except in California, is of secondary importance.

The vine adapts itself to nearly all soils. Almost any one, anywhere, can grow a bushel of grapes. Even a horticultural blunderer cannot stop his Concords, which he has left to grow wild over his fences and trees, from yielding a bountiful supply. The backyards of our cities afford a good place for a grape vine. The farmer's barns may easily be so covered as to keep the heat from his animals, while a bounteous harvest of rich food is supplied his family. Nothing is finer for an arbour than a grape vine, and it will cover the lattice with abounding bunches, although probably not as marketable as those cut from his trelisses. Over old stone heaps and stone fences many of our really good varieties will creep and crawl, and produce quantities of grapes. Over the cottage door, or

trained on the walls of a country home, the grape is equally beautiful and useful. The blossom is very sweet — especially that of the wild grape. I have one vine that has covered verandahs, porches, windows, and gradually climbed over the attic windows, and half way around the house. It has branches over one hundred feet long.

The fruit of the grape is borne on new wood, and so it happens that a severe winter, unless it kills the vine itself, cannot destroy the fruit buds. In this way we get the grape and the quince, when other fruits of a hardy sort are destroyed. The danger comes later, from spring frosts, after the branches have started and the blossoms put forth. Even then if the freeze be exceedingly hard, secondary buds occasionally put forth, giving a new set of blossoms, with fruit. What we want, and must trim for, is good stout canes, that will weather the winter and give strong fruit buds.

Although the grape is so cosmopolitan in its nature, there are special fruit sections, where the vine is best adjusted to the climate and soil. The largest and best known grape areas are the Lake Erie region, including a part of New York State, a part of Pennsylvania, and Northern Ohio. This grape area reaches around into Michigan on one side, and Ontario on the other. Western New York has a remarkable grape section inclosing a cluster of lakes; and the whole of the Hudson River Valley in Eastern New York is notable for its vineyards. In the South there is an enlarging area, reaching from Northern Georgia and Alabama across into the Ozark region of Missouri and Arkansas. California is also producing immense quantities of grapes. The vine seems to be adapted to nearly the whole of that state; and the fruit is being very largely manufactured into raisins as well as wines. Over one

hundred and fifty thousand acres are devoted to grape growing; of which one-seventh are said to be table grapes, two-sevenths raisin grapes, and four-sevenths wine grapes. The old Missions, established by the Catholics in the eighteenth century, are now remembered and will be commemorated by their grape growing. The Mission Grape was found in California by the early pioneers, and for a while was largely planted. It is giving way to our modern crossbred varieties. The North Pacific Coast goes back to table grapes; planting as a rule many of the varieties best known in the Eastern States.

Among the varieties which are now most popular in our vineyards and for home use are:

Barry — Bunch large; berries large, with a delicate sweet flavour; and ripens with Concord — one of Rogers' hybrids.

Campbell's Early — This new grape is a very strong grower and ripens with Moore's Early; but it is considerably behind that variety in hardiness. Bunch and berry are both large and glossy black. Flavour sweet and pleasant. The seeds are few and small, and they part readily from the pulp.

Concord — This well-known grape must be credited with having started the wonderful evolution of new varieties, which characterized the last fifty years. Where it can be well ripened it still stands very high as a home and market sort. It needs a longer season than can be given it in much of New England and New York, or the Northwest.

Herbert: Rogers' No. 44 — One of the best of the black grapes. The bunch is very large, and the quality hardly exceeded. It ripens about ten days after Worden, and follows that variety on the table.

McPike — This new grape is said to be a seedling of the Worden, and is fully as hardy and productive. The bunch is compact and very large; while the berries are of mammoth size — sometimes measuring one inch in diameter. It seems to be a decided acquisition throughout the whole grape belt.

Moore's Early — A very large berry, and on old vines a large bunch; flesh juicy and sweet, with very little pulp. It ripens very early, but hangs well on the vine. I have found it to be, with Golden Pocklington, ahead of all others in hardiness.

Wilder: Rogers' No. 4 — Gives a very large bunch, and large berry; and when well ripened is sweet and juicy. The vine is hard and a good bearer. It would be one of the best black varieties if it ripened a little earlier..

Worden — This, with Herbert and Moore's Early, I consider the three indispensables among the black grapes. It looks very much like the Concord in berry and bunch, and is said to be a seedling of that variety, but ripens at least two weeks earlier. It is sweet as soon as it begins to colour — in which it greatly differs from its parent.

Of red and purple varieties select:

Agawam: Rogers' No. 15 — One of the best he produced. The berries are very large, with a thick skin, which enables them to keep late into the winter — although ripening early. There has been some confusion in placing this variety on the market, as there are two sorts, very distinct in vine and berry, passing under the name of Agawam.

Brighton — One of the noblest grapes yet produced; yet it has unfortunately no power of self-pollenation. If grown by itself it

THE GRAPE IS EQUALLY BEAUTIFUL AND USEFUL

A CURRANT PLANTATION MAY BE KEPT IN BEARING FOR TWENTY YEARS

will be absolutely barren; but alternated with Worden or Moore's Early, it will be loaded with very large bunches of large berries. It ripens very early, before Worden, and is not a good keeper. It loses flavour by storage. The vine is vigorous and healthy.

Catawba — One of our oldest varieties, and while worthless except in chosen localities, it is, in such localities, the market grape for late sales. It does not mature perfectly, as a rule, even in the lake section of Western New York.

Delaware — Small but delicious, rather delicate in growth, and not entirely hardy outside the grape homes. Sweet and sugary, and ripens early.

Gærtner: or Rogers' No. 14 — One of the best of all the Rogers' hybrids. Quite hardy, and of extraordinary vigour of growth. The bunches are large, as are also the berries; with a tender and very rich pulp.

Gœthe: Rogers' No. 1 — In the South this is a superb grape — one of the very best; pale red with melting flesh. It is not sufficiently hardy for the North without winter covering.

Iona — This superb grape was produced by Dr. Grant; and in quality it may stand as the very ideal. Unfortunately it is not sufficiently hardy for most of our vineyards and gardens. It is one of the few varieties I am willing to cover in the winter. If not dead ripe before freezing weather, it may be picked and carefully stored; when it will be found to become juicy and refreshing. It is an enormous bearer when well grown.

Lindley: or Rogers' No. 9 — A very long-jointed vine, very productive, and vigorous, but needing much room in the vineyard. A poor self-pollenizer; but when you get the fruit in perfection there are few grapes to rival it. Grow with Worden or Concord.

Massasoit: Rogers' No. 3 — One of the earliest grapes, and most delicious. It would be one of the most desirable for planting if it were not so very susceptible to black rot.

Salem: Rogers' No. 53 — Ripens too late — that is with Concord — to make it the grape for the multitude. The bunch is large and compact; and the berry very large, juicy and rich.

Vergennes — A very delicious grape; rather thick-skinned, flesh pulpy, and a long keeper. The vine is hardy and productive if well trained.

White grapes include some of our most magnificent varieties; but are not as popular among every-day purchasers as the blacks and reds. Among the best are.

Colerain —A delicious and very sweet seedling of Concord, having few seeds. Ripens with Moore's Early, but hangs on until frost. The vine is hardy, a vigorous grower and abundant bearer.

Diamond — In some sections this has become a leading variety among the early sorts. It is white with a yellowish tinge; a shade of colour that characterizes the foliage also. I have found the vine very subject to anthrax, and the fruit irregular in ripening. At its best the quality is excellent, and both bunch and berry above medium in size.

Eldorado — I consider this one of the highest flavoured grapes I have ever tasted. It ripens medium early; is a large berry and a large bunch, and fairly prolific.

Hayes — I hold this to be absolutely indispensable. The quality is delicious, and very similar to Lady. The bunch is medium in size, as also is the berry: crop sure and large. Bears neglect.

Lady — The highest flavoured of all the white grapes — per-

haps of all grapes. With me it gives meagre crops, due, I think, to lack of proper pollenation. Berry and bunch are large; and the vine vigorous and entirely hardy. My earliest good grape.

Lady Washington — One of Mr. Rickett's seedlings; vigorous in vine and hardy, carrying a large and handsome bunch of white grapes, that never fully ripen in this section (Central New York).

Martha — A seedling of Concord, of medium quality, and very prolific. Bunches and berries are both medium in size. Recommended for careless growers, in cold climates.

McKinley — A new grape, said to be as large and productive as Niagara, and fully ten days earlier — with a flavour equal to any on the market. The vine is reported to be a very strong grower, with healthy, robust foliage.

Niagara — This magnificent grape holds the position among the whites that Worden holds among the blacks. The bunches are very large, as are also the berries. It is rarely dead ripe when placed on the market; when fully ripe the quality is very fine.

Purity, and Greins' Golden — These two grapes with me seem to be very nearly or quite identical. As generally seen they would class as white grapes; but when more favourably ripened they secure an amber hue. I am very fond of them because of their acid flavour — which causes them to be rejected by most people.

Pocklington — Another seedling of the Concord, and one of the two or three hardiest grapes in cultivation. The bunch is large and compact; the colour when dead ripe is a rich golden yellow; the flesh pulpy, but juicy, and of good quality; the vine extraordinarily productive. Unfortunately it needs a long season to fully ripen it.

The above list does not undertake to cover, or anything like cover, the enormous number of excellent grapes. I have especially

left out some exceedingly promising varieties produced by Mr. Munson, of Denison, Texas. Mr. Munson is a grape authority of the highest rank, and has produced a brilliant list of hybrids. Among these, so far as I know, none surpass Brilliant, Wapanuka, and Headlight. A new grape of the very highest quality is Nectar, or, as it is sometimes called, Black Delaware. The vine is very hardy, and the berry is larger than Delaware, and of the finest quality. The fruit hangs on the vine until cold weather, although ripening with Moore's Early. Esther is another new variety that ranks high. The vine is hardy, and the grape of excellent quality. Lucile is a most promising new red grape, ripening soon after Moore's Early, and as large as Worden, in bunch and berry. Jefferson, one of Rickett's seedlings, ranks with the best three or four grapes in existence. With me the vine is hardy, but the season is seldom long enough to perfect the fruit. Diana is one of the old grapes that cannot be discarded, considering its excellent keeping qualities. The bunch is large and exceedingly compact, needing a long season to ripen it. Alice resembles Diana, but is earlier and better, and even a better keeper. Hicks must be added to our list as a close rival for Worden. It is said to be of very rich quality; very large in bunch and berry, and black in colour. Stark Star is a new grape, carrying astounding bunches, a foot long. The vine is a vigorous grower and very prolific. It should be the parent of a great race of grapes. Among my own seedlings I find good rivals for the best varieties named.

No list of grapes can be made which will cover all sections of the country. It is, however, fortunate that some of our very best varieties are cosmopolitan in their adaptability to a very wide range of climate and soil. Prof. Munson recommends for the

Southwest, for early grapes, Moore's Early, Nectar, Winchell, and Diamond; for main crop McPike, Campbell's Early, Beacon, Concord, Brilliant, Brighton, Delaware, Delago, Catawba, Jefferson, Wapanuka, Niagara, Rommel, Triumph. For late varieties he selects Lenoir, Kiowa, Herbemont. The list selected for the clay soils of Louisiana, Mississippi, and Alabama, does not differ from the preceding, except that it adds Worden, Lindley, Empire State, Mrs. Munson and a few more. The State Horticultural Society of Georgia selects for that State, for general planting, Moore's Early, Delaware, Diamond, Duchess, Concord, Ives, Worden, Lenoir, Merrimac, Clinton, Wilder, Welcome, Catawba, Diana, Berckman's, Lindley, Salem, Goethe, Niagara, Elvira, Lady Washington, Triumph. For shipping, Moore's Early, Delaware, Ives, Niagara, Concord, and Carmen are recommended. The best for table use would include the above and add Goethe, Winchell, Brighton, Brilliant, and a few more. Varieties of the Scuppernong family, including Thomas, Flowers, Tenderpulp and others, should be planted in every vineyard south of latitude thirty-five degrees; and are especially valuable along the Gulf Coast, from Texas to Florida.

Where grapes are liable to serious attacks from birds, or from bees of any sort, or from other insects, the plan is growing in use to bag the bunches as soon as possible after the fruit begins to set. Grocer's paper bags are used, of two- or three-pound size. After the bags are drawn over, cut a piece off from the lower side, so that water may not be caught and retained. The cost of the work, including bags, pins and time, does not exceed one-half cent per pound for the fruit. The sacking gives us perfect protection

from rot and mildew, as it does from wasps and birds. Of course, very little advantage will be secured against fungi if sacking is deferred until the grape is half grown, but it still may be of great advantage in the way of protection from our fruit-loving rivals.

Grape growing in California is dominated entirely by the raisin industry. Sixty per cent of the whole grape crop of the State is converted into the seeded-raisin crop. For the year 1903 the total output of the establishment at Fresno amounted to five thousand five hundred car loads. This, however, included ninety per cent of the whole stock put upon the market. The varieties raised for making raisins are the Muscatels, the Malagas, the Seedless Sultanas, and the Seedless Thompsons. The capacity of the companies plant at Fresno is four hundred and five tons per day. It is claimed that the product is superior to any other in the world, for its keeping qualities. These seeded raisins are not only holding the home market, but are shipped in large quantities to Mexico, to Canada, Australia, and the European markets.

The propagation of the grape vine is most readily done by cuttings. These are made of new wood, cut in the late fall, about one foot in length to eighteen inches; and inserted half their length in the soil — very much like those of currants and gooseberries. Press down the soil tightly, and prevent the settling of water about the bed. The ratio of rooting is nine out of ten, and the plants are strong for replanting by another autumn. The custom of tying these in bundles, to be kept in cellars until spring, reduces the number that will take root. The grape is also easily grafted, and generally this is done just under the surface of the ground. Cut off the whole vine, a few inches below the soil, and insert your cions by cleft-grafting, precisely as in orchard trees. The ease with

which grape seedlings may be grown, makes it desirable that every one shall experiment with them. I have found that the percentage of valuable new kinds is so large, that in no other line can I get more satisfaction. At least one-half of the vines grown from the seeds of choice varieties will produce valuable grapes. I am in the habit of collecting from about my cesspool, each spring, enough young vines, self-sown, to keep me interested in novelties. We must, however, be cautious about sending out new varieties for sale, until we are quite sure that we have got something decidedly better than the common stock of our vineyards.

Grape trimming is an art that very few are willing to master. In planting take either one or two year old vines, and cut back to about two buds. The canes coming from these should be allowed to grow through the year, tying them to trellis or stake. At the end of the year, cut back the strongest cane to two eyes, and remove the other cane entirely. At the end of this year cut back to three or four eyes, having kept out all superfluous shoots. We are now ready for a trellis. In my own vineyard I set posts at about every twenty feet, making the end posts the strongest. Along these are stapled wires; the lower one about two feet from the ground, and the second about twenty inches above, while the third is twenty inches above the second. My vines are planted from eight feet to twelve feet apart — according to the variety. Some varieties, like the Lindley, making very long wood, need more room than the Delaware which makes shorter joints. The rows are about ten feet apart; allowing a row of currants or gooseberries between each trellis. Having now your vines established, and ready to be trained, you have to choose between methods of training. In the Hudson River valley the Kniffin system is generally adopted; but in the

neighbourhood of Lake Erie we have what is called the Chautauqua system. My impression is that no treatise can expound these systems, so as to make them entirely clear. If you propose to enter largely into grape growing, you will act wisely in visiting a well-established vineyard, in order to make a study of trimming, under the direction of a practised vineyardist.

I shall, however, give you as compact a description as possible of the systems most in vogue, which will serve as a general guide. Mr. J. Skelton, of Ontario, has put the matter in very good shape, and I shall follow closely his notes. Unless a very strong growth is made, cut back the vine at the close of the first season, to three or four buds. Put down your posts the following summer, and if you contemplate the upright or high-renewal system, stretch a wire two feet from the ground. Sharpen the posts, and drive them down eighteen inches, and about eight feet apart.

Make the head of the vine the next winter, by cutting away all but the main cane, and one strong shoot on a level with the wire, or a little below. This shoot, and the main cane above it, are to be the arms. Cut them back to five or six buds, and tie to the wire, in opposite directions.

The third season, upright shoots will grow from these, which must be tied to a second and third wires. This season you will get a few grapes. The winter following cut away all this growth, including the arms, excepting the strong shoots; one on either arm, as near as possible to the crotch. These two shoots are cut back to eight or ten buds, and tied down to the lower wire. The vine now bears the same shape as when pruned the previous winter.

Always prune back each winter to this shape; getting new arms, either from the old wood in the crotch, or, if good canes are not there,

from the first strong shoots in the old arm. Every five or six years allow a good cane to grow up from the base of the vine, to take the place of the original head; and when that is ready, cut out the old wood. All wood in the vine will thus be comparatively new — the great point in grape culture.

If the ground be rich, and the vine a strong grower, such as Niagara or Concord, it is well to leave four arms instead of two. A vine trained in this way will carry forty or fifty buds, sufficient for a tremendous crop. When this is done, train two arms each way — tying both to the bottom wire.

The Kniffin system does away with much of the summer tying. It carries the main stem right up to the top of the wire. It has four arms; two extending in each opposite direction, on a top and a bottom wire. The trunk and arms are securely tied, but the shoots are allowed to hang; in fact they must be pulled free two or three times during each summer. The top wire of this system is six feet, and the lower wire three feet six inches from the ground. The arms are cut away each year, and are replaced by renewals from the main trunk, or by canes from spurs near the base of the arms. This system has the advantage that the hanging shoots afford shade, while allowing a free circulation of air. The fruit being high up, is not hurt by reflected heat from the earth; less time is required for summer tying; cultivation is easy; and such small fruits as currants or gooseberries may be grown between the rows. When the hanging canes become so long as to touch the earth, the ends should be cut off. This operation should, however, be delayed as long as possible, because it tends to induce laterals, which choke the vine. The system seems natural to the strong-growing hanging varieties, and is gaining greatly in popularity. Stout, upright

growing varieties like the Catawba, and less vigorous growers like the Delaware, are better suited to the high-renewal system. But taken altogether the Kniffin system is destined to supplant other methods of training.

Those who wish to make a study of training grapes for laying down during the winter, will do well to consult Budd's "Horticultural Manual." In California the grape is invariably pruned to low stumps. In the Southern States laying down is never a necessity. The common systems in those states are training to stakes, and the canopy system. When the former is adopted, stakes of five or six feet in length and two or three inches in diameter are used. One stake should be set when the vine is planted. The growth of the first year is confined to a single cane, which is tied to the stake. The next winter the vine is cut back, to leave the cane not more than four feet in length. From two to four side shoots are left, each with two or three joints. The next spring two shoots from the roots are allowed to grow, and are tied to the stake. These are pinched off when they reach the top of the stake. At the end of the second season the old cane is cut off, and the two new ones are allowed from three to five spurs, of two or three joints each. This constitutes what is called two-stake system. The canopy system is worked out by training the vines on three wires, which are stapled to the top of heavy cross arms, fastened to a row of posts. The posts are also fastened together by a heavy wire six inches below their top.

Mr. T. V. Munson describes a trellis system of his own devising. "Wires are drawn tightly through the ends of the cross arms, and a third wire through the posts, a little lower than the cross arms — forming a trough-like trellis. The vines are planted di-

rectly below the middle wire. When the vines start, train one vigorous shoot directly up to the middle wire. When that is reached pinch the tip out, and in a few days several of the uppermost buds will push. Allow only two to grow; carrying them in opposite directions, as far as they will grow that season. After leaf-fall cut these back, leaving from two to four buds each, and tie the ends firmly to the middle wire. The next season, after four or five leaves appear beyond the clusters that are set, I pinch back the tip of each shoot. This will cause the dormant buds at the crotch of the vine to push. Allow two to grow up, over the bearing shoots in the trough, and then along the lower wire beyond, as far as they please. Do not allow these to set any fruit this season. Rub out all other shoots that start. This treatment causes the vine to spend its energies on big bunches, with big berries, and in laying the wood for the future crop just where you want it. The posts are five feet high, so that the trellis will be found to be just the thing to save back strain, and time in work. After the first year, the old arms with their lateral shoots that have borne, are cut away at one stroke; leaving only the young arms to produce the next crop. These are cut longer than those of the first year. Tie the arms to the middle wire as before, only more ties will be required. By the third year four arms, two in each direction, and reaching half-way to the next vine, may be left in pruning; and so the whole trellis will be covered with fruit; which is a grand sight to behold, as you put your head under the fringe of foliage. Each cluster hangs clear, and perpendicularly in the air; is thoroughly ventilated, and lighted; yet is shaded from the scorching sun; out of sight of birds; yet in the easiest position for pickers. These sit along under the trellis, in the shade, and fill their baskets; and there the man with the wagon

finds the baskets, cool and clean, as he drives along loading up for the packing house. This system allows every breeze to pass freely below the trellis, and prevents dampness; while storms have no broadside to push against."

The grape vine is subject to many fungus diseases, and to the attack of many insects. Of the latter the most serious is the phylloxera: a pest, however, that has, so far, done very little damage to our native grapes. On the Pacific coast, as in Europe, it is working great mischief with the vinifera varieties. The more common troubles that we have, especially in the Eastern States, are mildew and black rot. I have found very little trouble with mildew on high ground, and where vines are kept open to sun and wind. Bordeaux mixture is rather a preventative than a cure. Where grape vines are trained upon houses or other buildings it is impossible to apply Bordeaux without staining the walls. In this case mildew must be prevented by a free circulation of air. Black rot, however, is not so easily disposed of. It will frequently strike in very suddenly, and make a promising crop worthless. It hardens the berry, and prevents its natural development into an eatable fruit. Here again the remedy is preventative largely. Bordeaux should be applied before the buds open in the spring, and again every two weeks until the fruit is near ripening. There is very great difference in the susceptibility of different varieties to this disease. In my vineyard I find Massasoit decidedly the most likely to rot. Moore's Early, Pocklington, Worden are compartively immune. Still more troublesome at times is a form of anthrax, that attacks both stem and fruit — sometimes known as fire-blight. The best remedy is a thorough swabbing of the vines with copperas water, applied during the winter, or early in the spring before the foliage starts. It

must not be applied later, because it will burn the foliage. After this application of sulphate of iron or copperas, apply Bordeaux freely and frequently. The Department of Agriculture, at Washington, and many of our State Experiment Stations have issued Bulletins, both concerning grape diseases, and the vexed question of trimming.

The planting of grapes for home use is greatly on the increase, as it ought to be; but it is not wise to venture into the ranks of vineyardist, with the expectation of profit, unless you know your market very well, and are an expert in the culture of the vine. Vineyards are being plowed up in our grape-growing sections — especially in the South. Grapes from the Keuka Lake section are selling at from ten to thirteen dollars per ton; giving a possible profit of thirty to fifty dollars an acre, to skilled growers. Meanwhile grape growing under glass, which was quite common forty years ago, has almost entirely passed away. It has become so easy to grow excellent varieties in the open garden — our improved varieties rivalling the best cold-house varieties — that the cost of a house has become superfluous. Loosening from the trellis, and laying on the ground is all that is necessary. A few exceptions there are, including Iona, Duchess, Goethe, and Delaware, which need more or less covering. I close this chapter with earnest advice to all those who own a small bit of land, to grow at least a few grape vines.

I recommend for those who can grow only half a dozen vines, Moore's Early, Niagara, Worden, Nectar, Brighton, Herbert. In addition to these, McPike and McKinley will probably prove to be splendid hardy home grapes. Where you are willing to lay down and cover for winter, you will find Iona the very ideal.

For a climate south of New York State, Jefferson cannot be left out. Lindley and Gaertner are so good that they should be included if possible; while Triumph and Brilliant will be in every first rate list, where the season is fairly long. Probably the one ideal grape for careless home culture, or for careful culture either, is Worden; closely followed by Niagara. I have not included Campbell's Early, although many will take it in the place of Moore's Early. Brighton and Herbert are not self-pollenizers, and must invariably be planted in close connection with other varieties like Moore's Early and Worden. I have not included Concord, simply because it is not likely to get well ripened in our northern districts; and where it is well ripened it is not equal to Worden. It is, however, hardly to be surpassed for growing wild on trees. There are thousands of places about the country where wild grape vines are climbing hand over hand through trees, or spreading themselves over rocks, and economically could be displaced with Concords or Wordens. A very rampant grower for such purposes is the August Giant. It is not, however, an August, but an October grape. At all events plant grapes, and plant freely; eat grapes and spare your beefsteaks.

CHAPTER ELEVEN

CITRUS FRUITS

ORANGE — The citrus fruits that reach our markets include the orange, the lemon, the pomelo, citron, and lime. The custom of planting wild seedling trees was only slowly changed to the growing of trees from the seed of sweet oranges. It has been found that varieties of sweet oranges, grafted on the hardy citrus trifoliata, are most able to resist the cold. Pomologists have introduced several of the Japanese varieties, which are very successful, when grafted on hardy stock. Budded trees bear early, and the profits begin when the trees are three to five years old.

The orange has three centres of culture in the United States — Florida, California, and a small section around the Gulf in Louisiana. The soil of the Delta is all right for the orange, while there is such abundant rainfall that irrigation is not neccessary. Blizzards, however, reach this section, and make the culture of the orange quite laborious. Several ways have been devised of protecting the trees. In some cases the orchards have been flooded on the approach of a freeze. The practice of banking the trees a few feet high, whenever frost is announced as approaching, is quite common. Of course, this practice does not protect the limbs and fruit, but the trunk is saved; and it becomes possible to grow a new tree, which will bear within a year or two. The varieties most

commonly grown in the Delta are the Mandarin, Tangerine, and Satsuma; but all the fruit produced by this section is absorbed in the Southern markets.

An orange grove in the Delta must be first well drained, and the soil carefully pulverized. The trees are generally set thirty or forty feet apart in the row. When ripe the oranges are carefully gathered by hand, then assorted, and packed for shipment in either boxes or barrels. Where the soil requires it a fertilizer is applied, containing fifty pounds of nitrogen, fifty pounds of potash, and twenty-five pounds of phosphoric acid, per acre. A long list of varieties, known as Creole strains, is raised — nearly as large as the list of varieties in a Northern apple orchard.

In Florida orange trees are supposed to have originated from seeds scattered by the Spaniards, and by the Indians who obtained the fruit from the Spaniards. The result was large orange forests; hence to this day the orange orchard is called a grove. These groves sprang up where there were openings, and invariably where they were well protected by oak or other forest trees. It is the removal of these forests that has rendered the Florida climate more treacherous. It was not until after the Civil War that orange growing became a very general method of investment. By 1880 orchards appeared all over the state, wherever transportation facilities were convenient; and for a number of years the climate seemed to be entirely favourable. The pioneer who had laid out but one thousand dollars reached a crop value of over two hundred thousand dollars. In 1885-6 a severe freeze swept over the larger part of the State. All young groves north of the latitude of Tampa were seriously injured, or killed. But this was nothing to the terrible blizzard of 1894-5. The loss to Florida by this freeze and its

predecessor is estimated at one hundred millions. The crop had already reached six millions of boxes. This was suddenly reduced to seventy-five thousand boxes. Since this extraordinary setback, orange growing in Florida has moved forward again, but with very cautious steps. The crop is estimated now at between one and two hundred thousand boxes. South of Tampa the orchards are in excellent condition without protection, but north of that latitude all sorts of devices are used to protect the trees. Hundreds of acres are covered with sheds, made of canvas, or of slats. These cost from six hundred dollars upward per acre; yet the profit remains large enough to warrant the expense. A system of fires is adopted for the coldest nights, and is found effective.

In a very large part of Florida the land is suitable for orange growing; but, as a rule, the best groves stand on what is called "high pine land," and "high hammock land." High pine land is simply the land where the yellow pine predominates; and if the pines are mixed with oaks and hickory, it is called hammock land.

Commercial fertilizers are used, but on the hammock land a good deal of caution is used about stimulating the trees to rapid growth. On high pine land two tons of commercial fertilizer can be used to the acre, but the chief reliance is placed on frequent cultivation. It is estimated that constant hoeing will enable a four-year-old tree to do the work of an eight-year-old.

Seedlings are generally grown in the nurseries. The seed is sown thickly, and pressed down well before covering. A temporary shading is sometimes necessary to protect the young seedlings from full sunshine. At the age of six months they are transplanted into nursery rows. When three or four years old they are budded to choice varieties. After one season's growth the young trees are

in condition to be transplanted into orchards. After transplanting it is wise to mulch with straw, leaves, or other convenient material, in order to retain the moisture in the soil. When fertilizer is applied, the best growers make their own mixtures. It is applied in December and again in May. The Washington is the only navel orange planted in Florida, as the other varieties are found to be lacking in productive qualities. The Tangerine is popular, also Satsuma. There is a cherry orange, called the Kumquat; but this variety does not reach our general market. The orange crop is gathered largely according to the convenience of the owner. Early sorts are ripe enough to gather in October; but the later sorts not until January or February.

California is, however, our great orange state. Orange trees were grown from seeds by the founders of the Missions. These Missions reached from the far south to fifty miles north of San Francisco. After they were broken up, orange culture was neglected, so that in the middle of the nineteenth century Fremont wrote that there was little left of the orchards. It was supposed for a long while that the orange would thrive only in the southern part of the state; but it is found now that there are localities adapted to its culture as far north as Shasta, and in the mountains among the foot-hills. It was not till after 1880 that orchards greatly multiplied. After that it was several years before growers understood that there was enough difference in varieties of oranges to greatly affect the market. Varieties were planted that had to be either grafted over or rooted out. Orange seedlings are now grown mostly from Tahiti oranges, or from the Florida sour stock. The young plants are budded at two years of age, and are ready in one year more to be transplanted into orchards.

The varieties held to be most valuable for market are the Washington Navel, the St. Michael, the Blood, the Mediterranean, the Homosassa; but the Washington Navel is growing into more and more importance every year. This fruit is popular in market not only because of its rich quality, but because it is seedless.

The number of orange trees now growing in California is estimated at between four and five millions. In 1892 the State's output of citrus fruits was about eighty thousand tons; in 1902 it was five hundred and twenty-five thousand tons. Orange groves, in full bearing, yield very large returns. A crop of five acres recently sold, on the trees, for fifteen hundred and seventy-five dollars. A well cultivated orchard of ten acres should yield annually a profit somewhere between twelve hundred dollars and two thousand. Unoccupied orange land is worth about one hundred dollars per acre; while groves in good condition, including water rights, are selling as high as twenty-five hundred dollars per acre. In 1903 it was reported that thirty thousand car loads of oranges were sent out of California. As production increases the market has so far opened to meet it. It is thought that ten years hence California will be less able to supply the increasing demand than to-day. Growers of citrus fruits are looking forward anxiously for the construction of the Panama Canal; the opening of which it is estimated will reduce the present freight rate of ninety cents a box, to New York, by railroad, at least one third. We shall then have California oranges placed on the Eastern market at rates that will be within the reach of the commonest classes of consumers. Markets for all the fruit that California will ever be able to raise, however large that may be, will never fail. As production increases new markets have been, and will be, developed.

THE LEMON — It is not generally understood, but it is true, that the lemon is considerably more tender in wood growth than the orange. For a while it was planted quite freely throughout the whole of Florida; but the planting of orchards has been recently confined almost wholly to that portion of the state which lies south of Tampa. Lemons in our market may be cheap; but in estimating profits, we must consider that the demand is active all through the year. This makes the growing of them a good investment, wherever the climate will permit. Orchards are set with budded trees, about twenty-five or thirty feet apart. Grafting is done upon sour orange and rough lemon stock.

The cultivation of a lemon orchard is in all ways the same as for orange trees. Besides the other advantages derived from clean and steady culture, the development of fruiting is hastened. In Florida, cover crops of cowpeas, velvet beans, and other forage plants, are plowed under at the proper season, to add to the humus of the soil. The fertilizers commonly used are the same as for an orange orchard; consisting of sulphate of potash, and sulphate of ammonia, applied at the rate of one thousand pounds per acre. The lemon tree grows irregularly, sending out long arms, which tend to transform an orchard into a thicket. It is necessary to shorten in the branches every year, and thin out the new shoots.

In California, lemon growers have for many years been carefully studying the introduction of the best varieties from the Mediterranean, to displace the coarser varieties, at first planted. Every Northern consumer has recognized the great change in the lemons placed on the market. In place of the huge, coarse, thick-skinned varieties of thirty years ago, we have smaller, but thin-skinned and high-flavoured fruit. Naturally the lemon is adapted to a more

narrow range of soils than the orange; but the use of orange seedlings for stock widens this belt. It is absolutely essential to successful growth of this fruit, to have ample irrigation and constant cultivation. The varieties most commonly grown at present in California, are Lisbon, Eureka, Genoa, Villa Franca, Messina, and Bonnie Brae. Ripened on the tree, the lemon does not keep well. The fruit must be stored for some time, or as it is termed, cured, in order to make a good market fruit. It is in this way that the skin gets its pliable character, and is less easily bruised in handling. The result is large storage houses; but these are gradually giving away to home storage.

I am not sure but the most important fact, to be noted about the lemon, is that it has recently been found that seedlings of excellent quality can be grown and fruited in Southwestern Texas. In 1894, at the Industrial Exposition, in St. Louis, citrus fruits — notably lemons — were exhibited, and drew the commendatory attention of experts from Florida and California. The fruit was gathered in Cameron County, from trees that had sprung up from seed, thrown away after lemons had served their purpose. One of these trees produced over three thousand lemons in a single year. If an orchard should produce at that rate, the owner would realize two thousand dollars per acre. Samples were forwarded also to the Agricultural Department at Washington. Chief Pomologist Brackett, responded that, after having carefully examined the lemons, he found them "among the best ever received at this office." He added that he was greatly surprised that such fruit could be grown in Texas. Mr. William Doherty, an expert concerning citrus fruits, expresses his conviction, that soil, climate, and moisture conditions are as favourable in the location named

as on any part of the Pacific slope. This is in line with the growing conviction of pomologists that the resources of the Southwest have not yet been anywhere near exploited. The climate and soil combine to make it the home of a semi-tropical vegetation.

THE POMELO OR GRAPE FRUIT — This member of the citrus family is of growing interest to Northern consumers. Its consumption is mainly as a breakfast fruit, and is held to be of high value medicinally. According to Professor Hume, the oldest name for the grape fruit was Pomelo. There is no other reason for giving it its new designation except that the fruit appears in clusters. Some of the very large varieties on the market are called Shaddock, and are of decidedly inferior quality. Like the lemon, the pomelo is less hardy than the orange. The pomelo stock is growing in popularity, both for orange and for lemon orchards. The flowers are very large, very sweet scented, and appear in clusters. A single bunch of grape fruit often numbers a dozen fruits. These are nearly round, and three to four inches in diameter. The number of varieties has been considerably increased, and very much improved; but unfortunately every one of them has a very large supply of large seeds. The Florida Station reports that a pomelo tree, yielding eight hundred pounds of fruit, removes from the soil so much material that, as compensation, there must annually be restored over twelve pounds of commercial fertilizer. Still more must be added to compensate the exhaustion of the soil by the wood growth of the tree. Professor Hume concludes that "The experience of most growers points to the use of chemical fertilizers alone for all citrus trees. The grove fruits bear more heavily; a better quality of fruit is obtained; and the

trees are certainly in a healthier condition. Where large amounts of organic fertilizers are used, die-back will almost surely affect the trees; and ammoniated fruit, bearing shipping badly, is the result." He advises fertilizers at least twice in a year — just before commencement of growth, and again in midsummer. If nitrate of soda is used as a source of nitrogen, it is best to apply it in three separate dressings, in March, in May, and in July; but phosphatic and potash fertilizers only twice a year.

I remember well when one orange was so rare a visitor to my father's house, in 1840, that it was divided into six sections, and served the whole family. It now seems probable that the way will soon be opened for the private customer at the North, to order his own select varieties from the Southern producer, and receive them directly from the grove. Just before the great freeze of 1895, a few of us formed such a connection; and such oranges I had never before dreamed of — much less been able to purchase. At that time the crop was becoming so enormous that, as a Florida grower expressed it, "The blizzard saved us from bankruptcy."

The work of the Department of Agriculture has recently been applied to the creation of an orange hardy enough to be grown much farther north. It is not impossible that the whole of the Southern States, up to the Ohio River, will become orange producers. Dr. Herbert J. Webber, of the plant-breeding laboratory, has produced a large number of hybrids between the hardy citrus trifoliata and the sweet orange — some of which have already produced fruit and are full of promise.

The latest report from headquarters says, "Our orange experiments we consider remarkably successful. Only a portion of our trees have fruited, and we do not know what we shall get when

the returns are all in; but thus far we have four distinct results, that are extremely gratifying, and of unusual economic value. In the first place, we have a tart and bitter orange that is not suitable for the table, but makes the best marmalade you ever tasted. Second, we have a tart fruit, with a beautiful flavour that is every bit as good as grape fruit, and will be quite popular for table use. Third, we have a fruit as sour as a lemon, and full of juice of equally good flavour, and finally, we have a sweet, juicy orange, with as good a flavour as that produced on the banks of the Indian River, and it can be grown anywhere south of the thirty-fifth parallel. We propose to distribute the trees as fast as we can grow them, but it takes several years for such fruit to mature, and the public must have patience."

THE LIME — Lime culture is identical with that of the lemon. It is a useful member of the orange tribe, noted mainly for its value in cooling drinks. The tree is low and thorny, thriving on poor and rocky soil. It is hardly as capable of resisting cold as the lemon.

A very interesting field of experiment is open to us with the dwarf varieties of orange and lemon. While dwarf oranges are inferior, a variety of dwarf lemon is of very decided worth. I have grown them to weigh over one pound, on trees two feet in height. The tree itself is very beautiful, bearing very large flowers, at all seasons of the year. The fruit is fully equal in quality to the best varieties in market. It is certainly one of the most valuable and useful window plants in existence. The Kumquat is another dwarf member of the citrus family that can be grown on dwarf stock in the form of a bush; but on vigorous stock it does not exceed six

or eight feet in height. It is covered with golden yellow fruit, which is very much relished, either raw or in preserves. The flowers are like the orange and richly scented. The fruit does not exceed one inch in diameter and is consumed entirely, rejecting only a few small seeds. It is a superb window plant.

CHAPTER TWELVE

FIGS, DATES, AND OLIVES

FIGS — The fig is an old friend of the gardener. It is frequently referred to in the Bible; was cultivated by the Greeks and the Romans; and later introduced into Spain and France. It seems to have been grown successfully in England in the thirteenth century. Fig trees have been grown not only in Florida, but as far north as Virginia and Maryland, along the coast; but are too often damaged by severe winters to encourage general planting, even in northern Florida. The Smyrna fig is the one most known in market, and it has been a special problem to grow these successfully. The difficulty was pollenation. This problem was not solved until it was discovered that the Smyrna fig, in its own home, needed a special insect to convey the pollen. The United States Department of Agriculture undertook the importation of this important insect, and reported progress in 1901. It has since been found to endure the winters of California so well, that the commercial orchard of Mr. Roeding, at Frisco, produced fifty tons of Smyrna figs in 1902. The entomological problem solved, there remains the introduction of more Capri fig trees; the determination of those sections where they will best thrive — especially in the arid part of the West; and improvements in the methods of curing and drying the fruit. Secretary Wilson says confidently,

that "In a very few years Smyrna fig orchards will be in bearing in many places in California, and doubtless in other Western States. The future of this industry, which promises to be one of the greatest importance to the arid region of the West, becomes more promising every year."

The tree in California and in South Florida grows to a height of about twenty feet; but where the climate and soil are particularly favourable it rises to a height of fifty feet. The trees begin to bear when at a height of only four or five feet, yielding two crops in a season — the first from the axils of the leaves of preceding growth; and the latter from the axils of the leaves of the season's growth. The varieties commonly favoured in cultivation in this country are:

Adriatic — A medium sized variety; light green, with a yellow cheek; grown in California and Arizona.

Black Genoa — A large purple fruit, of rich flavour, grown throughout the fig section.

Black Ischia — Medium sized purple, and nearly black when ripe.

Black Celeste — Medium sized, of dark violet colour, and quite hardy in the Southern States.

DuRoi — Medium sized, bluish green; largely grown in California.

Green Ischia — A small yellow fruit, of good quality, and very productive.

Magdalen — A medium-sized, greenish yellow fruit, of the highest quality; grown throughout the South and in California.

Magnolia — Medium size, yellowish white, and good quality. If frozen this variety gives a good crop on new shoots of the season's growth.

Mission — A large, purple, hardy and productive sort; and considered about as good as the Smyrna. It is grown in Florida and California.

Royal — A very high flavoured and juicy variety; colour purple; a favourite in Texas and New Mexico.

Smyrna — There are two varieties passing under this name — the true Smyrna and another of fine quality, grown in Texas and Arizona.

Turkey — A brown fruit, with red flesh and delicious quality. The tree is one of the hardiest throughout the South.

White Bourjassotte — A waxy green fruit, with blood-red flesh, and of good quality.

White Genoa — Rose coloured, of good quality, thrives in Arizona.

White Marseilles — Medium sized, of green colour, and very sugary. This is very much used for drying throughout the fig sections.

The fig insect or fig wasp breeds on the wild fig; puncturing the receptacle of the cultivated varieties, and in that act, pollenating the fruit. Mr. Budd believes that there are varieties even superior to the Smyrna fig, that will not require the help of the fig wasp for pollenation. He thinks farther that varieties from Turkestan will prove hardier, and grow over a much wider belt. Dr. Regel says, "In Darvas, hardy figs form high shrubs, with a stem thicker than one's arm, which require no protection. The fruit is small, and is used fresh." Professor Budd adds that "At the fair at Nishni Novgorod, figs of fair size and good quality were shown, grown as far north as Bokhara, in Central Asia. These varieties probably could be grown up to the fortieth parallel in the prairie states."

DATE — The date grows on a palm tree, which stands from thirty to sixty feet in height, and is crowned with a large head of fronds, eight to ten feet long. The female tree bears a mass of from twenty to twenty-five pounds of fruit, annually. This fruit comprises the substantial food of millions of human beings; not only in Africa, but in Persia and Arabia. The fruit is used both fresh and dried; and is prepared for market by simply compressing into a solid mass. It is the tree of the desert, yielding its delicious and enormous bunches where the heat and the aridity of climate prevent any other fruit tree from even existing. In California the fruit seldom reaches perfection; but in the hot valleys of Arizona the bunches often weigh forty pounds, and the quality is of the finest; single trees yielding sometimes four hundred pounds. The Government has done a good deal, of late, in the way of importing young trees to be tested in Arizona. A large co-operative date orchard is established, containing five hundred and eighty imported trees, besides eighty native seedlings.

The consumption of dates is enormously on the increase in the United States. Palgrave tells us that "Those who, like most Europeans, only know the date from the dried specimens in shop windows, can hardly imagine how delicious it is when eaten fresh. Nor is it, when eaten fresh, heating — a defect inherent to the preserved fruit, everywhere, nor does its richness bring satiety. In short it is an article of food alike pleasant and healthy." Mr. Budd, whose experience surpasses that of all other Americans, tells us that he fully accords with this opinion. As we receive the date, it does not need much experience to discover that it has been prepared for market by a race whose conceptions of cleanliness differ very much from our own. Every effort should be put forth to increase the

growth of American dates — from a sanitary point of view, if no other.

Here again the way is open for a vast amount of work in the way of improvement. So far the date palms are the selections made by barbarians. Their work has been successful in securing for themselves a vast amount of food. In this country some new crosses have been produced already, which indicate that great progress can be made in the way of hardy trees, if not in the quality of the fruit.

The seeds of the date germinate readily, but they do not produce true to variety. In orchards the custom is to plant one male tree to about twenty-five pistillate trees. Pollenation goes on mostly by insects; but for entire certainty orchardists tie clusters of male blossoms above the clusters of the fruit-bearing. Date growing as an industry does not end in the production of fruit for market. Wine and vinegar are made from the waste products, and the roasted seeds are used for coffee — as well as for an oil; which is made into a paste, and mixed with the food of cattle. Baskets, mats, bags, and many other products come from the leaf and the stem of the date palm.

A Bulletin of the Department of Agriculture is very enthusiastic concerning the future of date growing in the United States. It asserts that, "The most intense heat, the most excessive dryness of the air, the absence of all rainfall, for months at a time, during the growing season, and even the hot dry winds that blow in desert regions, are not drawbacks, as in almost all other cultures, but are positive advantages to the date palm — enabling it to mature fruit of higher excellence. Nor does alkali injure the soil." The bulletin informs us that the Salton Basin in California is not

only a most promising region in the United States, for the growth of the best sorts of dates, but that it is actually better for their profitable culture than the oases of the Sahara Desert — from whence the best imported dates have been procured. It is shown to be probable that this single region is capable of producing dates enough to supply the demand for the whole country. Other sections in California, Nevada, Arizona, New Mexico and Texas are adapted to certain varieties which may be grown with profit. "Dry dates," varieties which are not at all soft or sticky when ripe, and which may be stored, and kept indefinitely, are never found in the American market.

THE OLIVE — The olive as commercially grown, is the fruit of an improved oleaster — which in the form of a shrub appears in our gardens as far north as New England. In the Bible the olive branch is mentioned in connection with the story of the Deluge. The tree was cultivated and improved by Egyptians of the older dynasties, several thousand years before Christ, and olive branches are found in mummy cases. Pliny tells us that it was cultivated by the Greeks at least six hundred years B.C. It thrives admirably in the dry climate of Syria; and is grown profitably at the Cape as well as in Australia. In this country its cultivation has been confined to California, Arizona, and New Mexico. But many thousands of trees that were planted in California proved unprofitable, because too much moist air reached them. It is found that the olive will come to perfection in the Sacramento Valley, and the San Joaquin, and in some of the valleys of the Coast Range. It is also successfully grown in the foot-hills of the Sierra Nevada. The first plantings of the olive in America involved a serious mistake as

to varieties. At present, among others that are grown for oil, are the old Mission, the Atrorubens, Manzanillo, Rubra, Pendoulier; while other sorts are grown for pickling.

It is said that our American products, both of olive oil and of pickled olives, are superior to anything that reaches us from foreign countries. This is due to the fact that we are working with better machinery, while greater attention is paid to cleanliness in the different stages of the work. On the Pacific Slope ripe-pickled olives are used very largely for food; but they are very rarely found as yet in our Eastern markets.

The olive is propagated, either from seed, which generates slowly; or from cuttings and suckers and layers. Propagating by tips or branch ends, cut four or five inches long, is the most common method. These tip branches are planted in sand beds, very much as we propagate cuttings of the quince at the North. The olive orchards of California are generally irrigated, and the trees are well supplied with artificial fertilizers. The system of cultivation is not very much unlike that of an apple orchard; early culture during the season of growth; a cover crop later in the season, to be plowed under in the spring.

CHAPTER THIRTEEN

PINEAPPLE, BANANA, AND OTHER TROPICAL FRUITS

NO fruit book is complete in this day that does not take account of a list of fruits, of which Mr. Downing need make no reckoning, in the middle of the nineteenth century. Besides the olive and citrus fruits, noted separately, we have, growing within the limits of the United States, the pineapple, the banana, the guava, the mango, the passiflora quadrangularis, the Philippine lime berry, and several crosses of semi-tropical fruits, produced by Mr. Burbank and others. To this list should be added the Indian fig cactus and the manatee dewberry — a list, even then by no means exhaustive of fruits likely to prove valuable in the United States.

PINEAPPLE —The pineapple has become an American home product. In 1894 the importations of this fruit amounted to $750,000 in value; but during the same year the value of the Florida apples, sold in American markets, amounted to $4,000,000. If the climate could be absolutely counted on, the importations would be quickly reduced to an insignificant sum. At present the pine is grown safely where orange growing has been given up. This at first seems strange; but the pine is a low-growing plant, and can be protected where orange trees cannot. My nearest neighbour, in Lake County, Florida, builds latticed sheds over his

pines, about seven feet high from the ground; and under these grows them with entire safety. This is a very general custom throughout Southern Florida. The sheds have been found to be valuable in the summer against intense heat, and under them the pine can endure twenty-five degrees Fahrenheit. The cost of a shed, per acre, is somewhere between four hundred and six hundred dollars.

A good deal has recently been done in the way of evolving better varieties of pines. The Northern market is beginning to place before purchasers a large number of sorts, much better than the pine of even ten years ago. The varieties still most commonly grown are the old Spanish; but of the newer varieties those best known are the Blood, the Queen, the Sugarloaf and the White Antigua. Smooth Cayenne and Porto Rico are apples of good quality, and Black Jamaica, Black Prince and Prince Albert are named by the Horticultural Society of Florida as being of the highest quality.

Among the chief enemies of the pineapple industry is the, so-called, red spider — an insect that attacks the tender white portion, and does a vast amount of injury. The remedy is tobacco dust. Scale insects are also very troublesome, and have to be met with a spray of kerosene emulsion, or of whale oil soap. The mealy bug attacks the buds and tender leaves, and the fruit itself. The remedy is the same as for the scale.

One great advantage the pineapple has over other fruit is that it thrives in evergreen openings. The spruce or pine lands are cleared, and the beds at once laid out in checks convenient for cultivation. This cultivation consists in the frequent use of the Southern or scuffle hoe. Under sheds the soil must be stirred more

often. I am told that on Florida Keys there is no cultivation given to the pines farther than chopping down tall weeds. While it is dangerous to speak very strongly of new ventures, lest too many people let go of the old industries, I am confident that the pine industry offers a special chance to an enthusiastic plant lover and fruit grower. Land in Lake County, Florida, can be had for very low figures — good pine land — near small lakes and in healthy sections. Choice places of ten or twenty acres, well wooded with southern pine, I have seen sold at ten to thirty dollars per acre. Places more remote from the railroad are valued at much less, down to two dollars per acre. The taxes are almost nominal. From two hundred to four hundred dollars an acre is at present realized from a crop of pines; while those who invest in rare sorts can make double that money. The market to be sure is remote, but shipment rarely costs more than thirty to sixty dollars per acre. The cost of commercial fertilizers, which are those generally used, must also be deducted from profits. On the whole I do not see why a Northern family, with small capital and a modicum of energy; a family handicapped at home by unfitness for a severe climate, cannot make pineapple growing a success.

BANANA —This plant is cultivated not only for the fruit which reaches our Northern markets so freely as to become a necessity, but also for a fibre that is of considerable value. The addition of Porto Rico to the United States adds to our area a distinctly tropical climate, and a soil well adapted to banana growing. In Southern Florida bananas are cultivated quite freely, as far north as Jacksonville. They are also grown to some extent in Southern California, and there are a few plantations near New Orleans. The plant

will endure a few degrees of frost, and new varieties may yet be developed, which will prove adaptable several degrees north of the present banana limit. The yellow banana, most common in our markets, is known as the Martinique. The red banana, which was formerly sent North more freely than the yellow, is known in its habitat as the Baracoa. At present it is seldom exported to distant markets. Recently banana flour, and dried bananas, are being offered; it is said with great promise of increasing our dietary as well as our industries. A new variety of banana, very dwarf-growing is called the Dacca. It is said to be a most valuable acquisition.

MANGO —Those who have had the opportunity to taste a mango will not regret progress made in the adoption of this fruit among American products. It is generally conceded to be the finest of the tropical fruits. Only recently have our pomologists been able to propagate varieties without the laborious work of inarching.

Since the Government plant-houses in Washington have overcome this difficulty, we shall have the mango well in hand in Florida, and sure soon to freely reach the Northern markets. It must be planted on well-protected land, and well-drained; but it thrives throughout the whole of Southern Florida.

In the tropics there are more than one hundred varieties of mangoes in cultivation. The ripe fruits are eaten out of hand, and the unripe fruits are manufactured into all sorts of pickles and preserves. Some of the fruits weigh a pound. Recent experiments show that the mango can be successfully grafted, so that the varieties which resist frost can be multiplied.

Professor Van Deman writes from Florida, "The mango is one of the most thrifty, substantial, beautiful and useful fruit trees that grows in the tropics, and in Florida it is getting a good foothold. There is scarcely a clearing in the forest, where a settlement has been made, that does not have a few mango trees near the house; as we see apple trees in the North. The tree seems to endure neglect better than any other cultivated tree. It resembles in form of head, and size, and leaf the chestnut. The fruit varies in size, form, colour, and quality, as much as apples and peaches; but nearly all the seedlings are valuable. The shape is roundish oblong, and the size from two to four inches in diameter. The skin is smooth, thin, and of a greenish yellow or of a yellowish red colour. In flavour it is a mixture of sweet and sour, with all the rich and delicate aroma and piquancy imaginable. As yet there are very few trees of kinds selected for choice qualities, and named. The only variety well distributed, even among the most advanced fruit growers, is Mulgoba, which I secured at Bombay, India; and imported in 1889. The time will come when choice mangoes will be sold in the Northern markets as oranges were fifty years ago; to the great profit of the few who live where they can be grown, and are wise enough to plant the best trees. The United States Government has lately imported more of the best varieties from India and elsewhere." The mango is, however, known to most Americans only from inferior types, which dealers have frequently sold as curiosities. The flavour has been described as a mixture of tow and turpentine.

GUAVA—The guava is another most important addition to our fruit list from the tropics. Two varieties have been grown quite

generally in Florida — the Chinese and the Cattley; both able to endure a few degrees of frost. This widens the guava belt a little to the north of the orange belt. The tree will grow on almost any kind of soil — rich or poor, dry or moist. It is sometimes grown under sheds, like the pineapple. When grown from seed the guava is found to sport so freely that to secure the better sorts we are obliged to depend upon grafting. This however, is not altogether a drawback, since among these sports from seed we are continually liable to find an improvement. As a pot plant the guava makes a very interesting addition to our Northern conservatories. It can be grown in any ordinary room, without special heat, and in almost any fertile soil — blossoming constantly, and ripening its pleasant fruits. The pot should be plunged in the garden through the summer.

FIG CACTUS — The Indian fig cactus — Opuntia ficus indica, is grown freely in Porto Rico, and now to some extent in Southern Florida. It grows to be about ten feet in height, and bears great quantities of lemon-coloured fruit; two or three inches long, and of a pleasant subacid flavour. This fruit-bearing cactus is quite hardy, and is without spines. Other varieties of cactus have been naturalized on the western coast of Florida; and some of them are yielding fruits that are held in very high esteem for preserves.

POMEGRANATE — In our Bibles we find reference to a fruit called the pomegranate. It grows wild all over Central Asia; and in Persia is cultivated. Varieties thrive as far north as Samarcand, where severe winters are common. In Florida and California the pomegranate is entering quite rapidly into the list of market fruits.

The tree is not much hardier than the orange; but Professor Budd thinks that hardier varieties can be obtained from Central Asia. He saw and tasted varieties four to five inches in diameter. Those grown in this country are of considerable value in the preparation of summer drinks — being superior for that purpose to the lemon. The bark of the root is used as an astringent in dysentery and similar diseases. The rind of the fruit, when boiled, is used in the preparation of a smooth, black, writing ink; and in therapeutics it is also used as a remedy for tapeworm. Pliny wrote of the pomegranate in his day as "One of the most valuable fruits, both for medicinal and food qualities, and for beauty of tree and flower."

It is curious that, having been in cultivation for thousands of years, the pomegranate has not yet been brought into more general use, and its capabilities evolved. The varieties grown in this country are distinguished as those which produce acid, sweet, or subacid fruit. I do not know that there is any difference in their marketable value. The acid sorts are used largely as substitutes for citrus fruits. In our Northern greenhouses we frequently find varieties of pomegranate which bear either double red or double yellow flowers. These shrubs or trees are truly magnificent in flower, but they seldom give fruit. They can be grown in tubs out of doors, if given shed or cellar protection during the winter. In boxes or tubs, which should be three feet in diameter for a well grown tree, they stand about eight or ten feet high, unless cut back. For this sort of culture, it is best to build the tubs on rollers or small solid wheels.

AVOCATE — To these fruits may be added the Alligator Pear.

This is sometimes called the Avocate or Butter Pear. Although little known as yet, the Department of Agriculture believes it to hold great promise. It is more like an olive than a pear, except in shape; for it is relished as a salad rather than as a dessert fruit. In our Northern markets it retails at a high price — bringing large profits both to the grower and dealer. The demand is good and is increasing. It grows upon a tree native to tropical America, and has heretofore been imported from Jamaica. There is an increasing production in Southern Florida, and Southern California. In size it is like a very large pear; in colour it ranges from light green to deep purple. A large Alligator Pear, of the purple variety might be mistaken for a small eggplant. The pulp is soft and butter-like. There is a Mexican type, growing on a smaller tree, bearing a smaller fruit. This sort is said to be much more hardy than the other.

PITANGA — Surinam Cherry, sometimes called Pitanga, grows on a shrub, and has its home in South America. It has been introduced into Florida and Southern California. The fruit is about the size of the common cherry, bright red in colour, and having a pleasant acid flavour. It is beginning to find its way into domestic use for jelly making.

JAMAICA SORRELL — Is a fruit that resembles the okra in form; is of a dark magenta red in colour, and used for making jellies and preserves. The flavour is said to be suggestive of the cranberry.

LOQUAT — Our list is not complete without the Loquat. This is an evergreen tree, originally from Japan. It was introduced into

Europe in 1787. It has for some time been grown in the Gulf States, and has recently been introduced into California. It will endure considerable cold, so that it may be grown in the Carolinas along the Atlantic slope. The trees grown in Florida and around the Gulf are seedlings. It is thought that by careful selection there may be made great improvement in the size and form and flavour of the fruit. In fact a variety called the Giant, selected some years ago, is being freely grafted in California; while Mr. C. P. Taft, of Orange, in that state, who has made a specialty of loquat growing, has seedlings twice the size of the Giant. Fruit of the loquat is borne in terminal clusters; is of a subacid flavour; without many seeds, and of a refreshing quality. The improved varieties are already being shipped to some extent from Southern California to Chicago and New York.

Progress in the growing of tropical fruits would be more rapid, were it not so difficult to bring the best varieties to consumers, in their best state. Improved transit is rapidly overcoming this difficulty. We may look for an enormous expansion in the culture of such fruits in the near future. The development of the United States southward, especially around the Gulf of Mexico, has led to calling that section "The Orchard of America." One writer on economics says, "I think the people see that agriculture is to be our great future industrial force; and that the South and Southwest will constitute the garden of America. The riches that lie in the soil are as yet hardly touched. Around the Gulf of Mexico will probably arise a civilization far ahead of anything we have yet reached — conditions that will make all that we have heretofore achieved seem to be merely preliminary. We believe we are warranted therefore in calling the Gulf of Mexico the American

Mediterranean. Those who live twenty-five years from the present time will have seen the centre of our agriculture as well as of our manufactures and commerce shifted much farther southward."

CHAPTER FOURTEEN

UNDEVELOPED FRUITS

THERE are several American wild fruits that are capable of being civilized and developed. Among these two of the most promising are the papaw and the persimmon. These resemble each other very closely in foliage, although not in growth. The persimmon attains a height of forty feet, while the papaw rarely gets beyond the ambition of a shrubby tree, of ten feet diameter, in all directions. The head is round, if undisturbed in growth, and quite symmetrical.

PERSIMMON — The persimmon, botanically Diospyros Virginiana, should be brought forward into more general cultivation, for the sake of the tree as well as the fruit. The tree is admirable for shade; leafing out late in the spring, and dropping its foliage early in the fall — thus furnishing a fine protection against the sun during the hottest months; but leaving the sun to warm us dur- the rest of the year. This is the ideal work of the shade tree. The leaf is handsome and highly polished. The wood is very hard — our native and only representative of ebony. It is used for carving, and for making lasts; but if used for posts it rots in the ground. It grows wild through all the Southern States, and as far north as Michigan and New York. While ranked as a Southern tree, it is,

however, entirely hardy wherever the maple grows. I have found the limbs to be brittle, so that careless trimmers cannot be allowed in the trees. The fruit is often no larger than a chestnut; but selected sorts grow to the size of small tomatoes, and generally of the form of that fruit. Seedless varieties are found, but some of the better sorts contain too many and large seeds for comfort.

If eaten before ripe, the persimmon is astringent beyond all other fruits; but picked when fully ripe, and stored for a few days, or left upon the trees till lightly frosted, the fruit becomes delicious. Different varieties differ considerably, not only in shape and size and seeds, but also in flavour. The time of ripening ranges all the way from August first to the last of December. My custom is to leave a part of the crop on the trees until midwinter. Others are stored in baskets, in cool dark rooms, to be eaten as they become soft. When the persimmon is well perfected on the tree before very heavy frosts, it will stand freezing without losing quality. I have picked it in February, still retaining flavour.

Seedlings of our native persimmon frequently prove barren, and must be grafted. I have heard it asserted that the grafts are not likely to catch; but have not found this to be the case. Cions must however be inserted rather late, as the growth in New York State does not begin before May fifteenth.

The persimmon is quite liable to send up suckers, and in a wild state often creates a thicket. Transplanted suckers rarely grow, and labour spent upon them is wasted. If you desire to undertake such a method of increasing your stock, you must get as much as possible of the root; cut back most of the top, or even all of it; and set in loose, moist, but not wet soil. When started from seed

the persimmon will grow in almost any soil, although it dislikes standing water.

The only person in the United States who has, so far as I know, devoted much attention to improving the native persimmon is Mr. Munson, of Denison, Texas. His Honey Persimmon is said to be a better fruit than any Japanese sort. Mr. Samuel Miller made a careful selection of Missouri varieties; and I owe to him cions of great value. I had success with all the varieties; but am now confined to the Josephine and St. Thomas. All of the fruit which I cannot use is very acceptable to the birds, during the coldest days of March and April.

On the whole I can hardly speak too warmly of our native persimmon. It should be very freely grown; and it should be improved, until we can eliminate the coarser and more seedy sorts. I believe that in the South a good deal of use is made of dried or "figged" persimmons; the abundance of sugar in the fruit making excellent figs, without the addition of artificial sugar.

The Japanese persimmon has been grown in the United States since about 1870. Rev. Loomis, of Yokohama, Japan, was one of the earliest enthusiasts to make the value of this fruit known to Americans. The trees at first sent over proved, however, to be of the more tender sorts, from Southern Japan. They were found not to be hardy when grown north of the Ohio. Cions took readily when inserted in our native trees. Efforts have been made to select hardier stock from Korea and Northern Japan, but, so far as I know, no great gain has been made in adapting this fruit to our Northern climate. The Department of Agriculture has also engaged in the importation of trees from Japan; but after an experience of twenty-five years, it does not report any variety as successful above the thirty-

second degree of latitude. It is hoped, however, that seedlings may be produced, possibly crossbred with our native sorts, which will be hardy throughout the apple belt. The seedlings, so far produced, have the same tendency as the native persimmon, to produce only male flowers. Like the American persimmon the foliage is very beautiful — with broad, clean and shining leaves.

The fruit of the Japanese persimmon is very much larger and more attractive than that of the native. The time of ripening varies from September till January. The flesh is usually a rich orange colour, sweet but spicy, and should be eaten with a spoon. Some of the varieties are seedless, others are, like the native sorts, very full of seeds. They must be picked when quite hard and unripe, and as a consequence purchasers will frequently undertake to eat them while astringent. Let them lie until dead ripe and soft, and the quality is very delicious. I have eaten them when dried without the addition of sugar, and they were sweeter than the richest Smyrna figs. The excess of sugar in the juice is so great that no addition is required. It is in this form that the American public will probably first learn to relish the persimmon.

THE PAPAW — I am specially friendly to the papaw; a native small tree, found in the river bottoms of the West as far north as Michigan. It is easily acclimated in New York and New England. The leaf is shiny and very beautiful, while the form of the tree, if fairly grown, is nearly round. It requires moist soil, and if set in a very dry place the fruit will fall prematurely. A drought is liable not only to spoil the flavour but destroy the crop altogether. If you have trees in your orchard or garden, be sure to keep them well mulched, and during a dry spell keep the ground soaked.

The fruit of the papaw is in shape much like a banana; and from three to six inches in length. The skin is thin, and the contents are like whipped and sweetened cream. There is considerably variation both in the size and the flavour of wild fruit, and there certainly is room for some first-class horticultural work in the way of selection and evolution.

The blossom is unique among all fruits, being very large and of a chocolate hue. When these fall the fruit appears generally in doublets or in triplets, standing out nearly horizontal from the stem. I have frequently found bunches of four or five, generally about four inches in length when ripe. If the tree be kept well supplied with water, it should be, when full grown, ten or twelve feet through, and the same in height. It should yield annually about half a bushel of fruit. In the wild state I have very rarely seen a well shaped tree — only scrubs broken off and browsed by cattle. I very strongly recommend Northern home-builders to add to their collections for orchard and garden both the persimmon and papaw. They will probably be obtained most easily by growing seedlings, and grafting them. The only two firms in the United States, to my knowledge, that deal in them are Storrs, Harrison & Co., of Painesville, Ohio, and A. V. Munson of Denison, Texas.

MULBERRY—The mulberry can no longer be associated only with silk worms. About forty years ago we had in cultivation two or three improved sorts — the best being the Downing. I did not find that variety hardy, although the fruit was fairly good. Now we have a good list of fine sorts, many of them sufficiently hardy for Northern culture. Among the best that I have tested are Abundance and Sunrise. One of these is black fruited, the other white

and the fruit is borne in immense quantities. Seedlings frequently come up, bird sown, in our Northern gardens, and these can readily be grafted to selected sorts.

The mulberry is mentioned as eatable by Captain Newport, in 1607; and he tells us that his crew fed on them luxuriously — picking them on an island in one of the Virginia rivers. For some reason it is very seldom seen in our markets — possibly because too soft for carriage. It is a very sweet fruit, and usually drops from the tree as soon as ripe. Harvesting is done by shaking them on sheets.

The Russian mulberry is in the alba family, and notable for its hardiness. It is being planted at present on the plains for windbreaks. The fruit is small and of little value except for the birds.

CHAPTER FIFTEEN

NUTS AND NUT TREES

NUT growing is very rapidly on the increase in the United States, and this is because the American market-demands are growing. Physicians are urging us to use a much larger proportion of nut foods. Many of the nuts, especially the almond and the pecan (as well as the peanut) are manufactured into butter, so largely as to affect prices. Chestnuts are also used for a very palatable bread; and pecan nuts go into various foods. There is not a better pudding in the world than can be made of butternuts; and in cakes the chestnut and walnut are rivals. The Indians cultivated several varieties of nuts; and held their Councils in butternut groves. These groves or orchards sometimes numbered twelve or fifteen hundred trees, furnishing a large amount of food. Remnants are still standing in Central and Western New York, although the largest were destroyed, during the American Revolution — to break the power of their owners. At present we have under cultivation, the chestnut, walnut, pecan, almond, filbert, hickory-nut, cocoanut, and in Porto Rico is grown the Brazil-nut. I do not know that any one is growing the butternut for market, except as the trees are allowed to grow wild about the borders of meadows and pastures.

CHESTNUT—The chestnut is a very rich nut and very popular in market. Few of the natural trees are under culture, although millions of bushels of nuts are gathered from the forests and annually sold. The varieties most common in cultivation are the European and the Japanese. The European stock was not largely distributed until a chance seedling, which received the name of Paragon, began a race of remarkable trees, bearing very young, and yielding large crops of nuts of extraordinary size. Japanese seedlings have developed along the same line. Many of them produce nuts of great size, although the quality is somewhat inferior to the European. All of these vary in seedlings, and are liable at any time to revert, or to advance. The best plan is, therefore, to graft the finer varieties; and this is the usual custom with our nurserymen. Chestnut orchards are gradually multiplying — much like apple orchards. Trees of the improved sorts require to be set about twenty-five feet apart. The cultivation is very similar to that for other orchard trees; that is plow during the early months of the year, and in August sow a cover crop. When the trees are full grown, turn the land to sod, but mulch the trees annually.

PECAN —The pecan nut is rapidly growing into favour, and is found to thrive over a much wider section of the States than was formerly supposed possible. It is quite hardy, but finds its best habitat from Missouri southward in the Mississippi Valley. The improved varieties produce larger nuts, with thinner shells. Some of the orchards in Texas containing ten thousand or more trees; while in Florida pecan growing is becoming a favourite industry. I do not think that the tree is sufficiently safe north of Virginia and Missouri to make planting for profit worth the while, yet there

are many trees growing in Ohio, and even in New York. The nuts are generally planted where the trees are to stand. If preferred they can be started in nursery rows, and transplanted when two or three years of age. The choicest improved sorts must, of course, be secured by grafting. In a grove or orchard the trees should stand about fifty feet apart.

WALNUT—Walnut growing in orchards is of recent origin. Two varieties from Japan have been introduced; and the English variety, which came originally from Persia, has been cultivated with success — especially on the Pacific Coast. The walnut requires rich soil to become profitable. In California the increase of orchards is going on with great rapidity; the soil of the Pacific Slope being much better adapted to this nut than that of the Atlantic. Orchards are, however, to be found east of the Appalachian range, from New York southward. The trees are generally planted about fifty feet apart, and tillage is the same as for the chestnut.

Burbank reports that most of the walnut trees in his neighbourhood are pistillate, and fail to produce nuts. Another trouble is that staminate flowers appear too early, or else too late to be of service to the pistillate flowers. Where planted for commercial purposes, the practice has been adopted of alternating the varieties. While the English walnut is quite too tender for our Northern States, Budd mentions a variety obtained in Southern Russia, that is much hardier than the peach, and endures the climate of Missouri. He is confident that varieties from Central Asia will be obtained that will be as good as the so-called English variety, and will prove hardy as far north as Iowa.

The black walnut, native to the Northern States, is a noble

tree for lumber, and quite common as far north as Michigan. The nuts are the finest wild ones to be found anywhere in the world, but they vary greatly in quality. Burbank and others are endeavouring to improve them by crossing. Those who plant them should undertake to select seed from trees that bear the largest and best nuts.

ALMOND — The almond is a member of the peach family; but instead of developing the envelope of the seed, it has developed the seed itself. The tree has proved to be so very tender, that the culture, so far, does not largely extend beyond California, Arizona, and New Mexico. In California orchards cover very large areas, and the cultivation is carried on with scientific accuracy and success. The tree is pruned very little, and is grown in orchard rows, at a distance of about twenty feet apart. Professor Wickson reports that "the almond has yielded more fire wood than any other fruit tree which has been largely planted in California; yet in spite of these facts, the almond will remain an important California product, through the satisfactory performance of trees enjoying favourable environment." Budd reports that he tested Turkestan varieties that were large, smooth, and thin shelled. He thinks it probable that we shall obtain Asiatic varieties a good deal hardier than those of Spanish extraction. The Siberian almond is hardy as far north as South Dakota, but the fruit is very inferior. It may be of use in crossing with the better sorts.

HICKORY — The hickory-nut is closely related to the pecan. The little shellbark and the big shellbark are entirely hardy, and

very popular. The first of these grow on high land, and the latter is found generally in river bottoms. Most of the varieties that are under cultivation are of the little shellbark, or, as we generally designate it, the shagbark species. Like the butternut, the hickory-nut has heretofore come under cultivation to very slight extent. The trees have been ruthlessly cut away in the Western States; and so far orchard growing has not replaced them.

FILBERT—The Filbert has not proved to be adapted for culture in the United States, outside the frostless section of California. The flower catkins develop in autumn; and while the North is too cold for them, the flowers are likely to expand in the Southern States so as to be caught by winter frosts.

HAZELNUT—The hazelnut however is found very freely growing wild through the United States. Some of the varieties bear nuts as large as the filbert, and of superior quality. Cultivation has been carried on with success in the prairie states. The trees are cultivated early in the season; followed by cover crops. As the plants become larger they are mulched continuously, through summer and winter. With this provision it is thought that hazelnut culture will prove to be decidedly profitable. It is propagated by rooted suckers.

BRAZIL-NUT—The Brazil-nut does not prove to be sufficiently hardy for any part of the States; but it thrives in Porto Rico, and the Philippines. The tree grows to a very great height in the forest; but, grown in orchards, it adjusts itself very readily to civilization, by limbing out low down, and making handsome trees that bear

heavy crops. The nuts appear in clumps of fifteen or twenty, enclosed in a single shell. These great balls, five or ten inches in diameter, fall to the ground when ripe, and the nuts are easily harvested. Nothing, so far as known, has ever yet been done to improve this magnificent fruit, although there is a variety called the improved placed on the market. The oil of this nut is used for very delicate machinery, as in watches.

COCOANUT—The cocoanut is grown only in the very warmest portions of Florida, and in Porto Rico. I believe it has not proved a pronounced success anywhere in California. It likes proximity to salt water. The origin of the industry in Florida was the wrecking of a cocoanut-laden ship from the West Indies, on the coast, in 1878. The nuts floated in with the surf, and many were self-planted, while others were planted by the inhabitants who found them. The result was the rapid growth of a large number of trees, which netted heavy profits, and gave an impulse to cocoanut planting along the whole coast line. Since 1895, however, frosts have been as disastrous to cocoanut orchards as to orange groves.

PEANUT—Although, botanically, the peanut is not a nut at all, but a ground pea, yet for all practical purposes it classes among the nuts. It may, therefore, fairly have a place in this chapter. It grows as a vine, with blossoms at the end of a long tube; and after the fall of the flower, the peduncle bends downward, pushing into the ground. There the ovary enlarges into a yellowish pod, containing the seeds which we use as peanuts, The vine belongs among the cowpeas, and has the same faculty of extracting nitrogen from the air; by means of porous tubercles. For this reason the

plant might be plowed under to enrich the soil; but as now cultivated it impoverishes the soil.

The peanut was grown to some extent in the United States before the Civil War, but since that period its cultivation has in some years doubled, or even become threefold; so that now it is one of the most general and profitable crops of the mid-South: If careless culture did not rapidly reduce the cropping capacity of land, it would be far more profitable. But already, inside forty years, the average product per acre has been reduced from fifty bushels to about twenty bushels.

The soil requisite for peanut growing is a sandy loam, light and porous; yet almost any soil that can be made friable, and kept loose by cultivation, will be satisfactory — if it contains enough lime. It can be grown upon clay soil, and produce more pounds to the acre, provided proper cultivation be afforded — but clay soil will colour the pods. If the soil be not calcareous, lime must be furnished with the manure. In addition, the peanut needs a dressing of potash and phosphoric acid. The potash is generally supplied in the form of kainit, and the phosphoric acid in the form of phosphatic slag. For lime, thoroughly burned oyster shells are used, along the seaboard.

If planted after corn, the only preparation given is to remove the clods and roots — breaking up the soil carefully and leaving it clean. Seed selection should be very carefully attended to, as seed is very frequently damaged by the frosting of the vines, or by overheating. It requires two bushels of nuts in the pod to give seed enough for an acre. Very little cultivation is said to be required, except to keep the weeds entirely out of the field. They are grown either on the level plan, or in ridges.

There are several varieties of the peanut grown in the United States, and still others in the Malay Archipelago, in Africa, and in Europe. The Virginia variety is a long running vine, with spreading branches; growing flat on the ground, and bearing pods almost the entire length. The bunch variety grows more erect, and fruits near the tap root. There are in some sections of the South red varieties, as well as white. Louisiana reports a Spanish variety, which needs a much shorter period to mature, and may be planted as late as July. There is also quite a variation in the amount of oil produced by different sorts. It seems probable that we shall have a very decided evolution in the way of improved sorts, so far as quality, and quantity, and value of products are concerned.

Peanut kernels average twenty-nine per cent of protein, forty-nine per cent of fat and fourteen per cent of carbohydrates in the dry material; and, therefore, constitute food of a very high rank. The vines are superior to timothy hay as fodder for animals. When some of the nuts are cured and fed with the hay, the value of the fodder is greatly increased. Peanut oil is entering into the market very largely in competition with olive oil. After being pressed for oil, the fatty cake which remains constitutes a valuable animal food. Perhaps peanut butter is the most important product of this very curious pea. Its consumption is greatly increasing in the United States.

One of the most carefully prepared Bulletins sent out by the United States Department of Agriculture, insists that the peanut may be grown in any latitude where Indian corn will thrive; but it needs about five months free from frost. The seeds form during cool weather, in the latter part of summer and early autumn. The

most favourable conditions are an early spring followed by a warm summer, with moderate moisture and freedom from drought. The requisite conditions are found all along the Atlantic seaboard, as far north as New Jersey; throughout the Mississippi Valley, as far north as Southern Wisconsin; and on the Pacific Coast, south of the Columbia River.

PART SECOND

THE FRUIT GARDEN

CHAPTER ONE

THE FRUIT GARDEN

A FRUIT GARDEN is not a new thing; but the fruit garden has recently become a very new thing. It is no longer a bit of a yard, with two or three pear trees, a plum tree, a dozen currant bushes, and possibly a half dozen gooseberry bushes. We have brought into cultivation, within the last half century, the strawberry, the raspberry, and the blackberry; and we have so changed them, and so modified their relations to the household, and the market, that the work may be counted a revolution. It is a poor home now that has not in its own garden some of the creations of Rogers, Barry, and Kirtland. I remember well when, in 1882, I had my first vision of a Sharpless strawberry. It was on Sunday, and the sermon that it preached to me was more inspiring than that received from the pulpit. It showed me that when God plants gardens, "Eastward in Eden," that Eden may be our own backyards and fruit gardens.

There is restlessness all along the line. Ambition has been waked up, so that every owner of a garden is in the race to improve something. "What we want now," says my enthusiastic gardener, "is longer and stronger roots on the strawberry, so that it may feed deeper, and better resist the drought." The raspberry grower is looking and working for "a perfectly hardy Cuthbert";

only he would add a higher flavour. "A Turner and Cuthbert combined would probably make an ideal berry." Blackberries sharply resisted civilization. But we have got Eldorado and King Philip; and we mean before long to make them give up their thorns. In other words, human ambition has been transferred from the field of debate to the field of work. Nowhere is it so intensified as in the fruit garden.

In addition to home supplies there should be, and may be, a balance over. The trimmings from the orchard will reduce the coal bill. We can make our own vinegar, and we can feed a few hives of bees, to make not only our own honey, but considerable for market. The surplus will steadily increase, as we study the situation, until we have a few private customers. "All the success attained to-day by the fruit interests of the United States has grown out of the persevering efforts of a few men, whose home fruit gardens served, not only as testing stations, for determining the fitness of given sorts for new and untried localities, but as the propagating grounds in which sorts of the highest quality and greatest commercial value originated." This is the testimony of the Department of Agriculture at Washington.

All the time we are learning more and more of the economy of fruit raising, and finding out more about markets. Trees and plants that we have gathered together and planted, contribute marvellously to our delight, and quicken imagination and hope. It is not improbable that our relation to customers becomes also a very stimulating social affair. The man who has the best fruit, and whose grade and label is recognized as unimpeachable, will, by such means, come in contact with a grade of customers, who look farther than the mere pleasures of the table; they also will become

fruit enthusiasts. In a Bulletin issued by the Department of Agriculture the suggestion is made that every fruit grower should undertake to educate his customers. The suggestion is a good one. "If every purchaser were a good judge of the different kinds of fruits, the demand for fruits of high quality, which is the growers ambition, would become a reality. The encouragement of the cultivation of fine fruits in the home garden will do much toward teaching buyers this discrimination."

Until you have entered on the culture of berries and other small fruits, you can have no idea of the amount of care and attention that will be required. Begin planting with those sorts that will make the least draft on your time and toil. A good fruit garden is a thing of art as well as science. One of the first things to consider is such an arrangement as will reduce labour to a minimum; but at the same time we must not overlook the beautiful. If the soil is heavy it must be made lighter; and frequently this must be accomplished before planting takes place. Cover crops will bring this about, and add humus to the soil. The addition of coal ashes is one of the simplest means at the command of gardeners where anthracite coal is burned. Drainage is always a necessity, generally for the subsoil as well as the surface.

Not the least important matter is the location of the garden. It should not be too remote from the house; and very frequently it may be so located as to receive drainage from the barnyard. If possible, the fruit garden should have a warm exposure; toward the east or the southeast — receiving the morning sun, and gathering a large supply of heat during the day, to carry it through chilly nights without frost. For small gardens it is advisable to combine fruit growing with vegetable growing. In doing this many

economic suggestions will occur as your experience widens. Varieties classed as orchard fruits, by dwarfing, may become legitimate inhabitants of the garden. Dwarf pears are more commonly grown; but dwarf apples, and bushed cherries, plums and peaches may also be introduced. I have for many years grown my currants and gooseberries in alternate rows with grapes. Many of our fruits may also be grown as espalier trees, that is trained against a wall. This effort to reduce large-growing fruits to shrubby forms opens the way to a great deal of interesting experiment. Or, we may go farther, and combine our fruit garden with the vegetable garden and several sorts of orchard trees. This sort of arrangement should be worked out by each one for himself. Simply bear in mind that gooseberries like shade, and currants will endure a measure of it; while strawberries and red raspberries like a full measure of sunshine.

Those who own only small suburban lots will be most interested in determining what can be done in a very limited area. The currant has long held precedence; and in English gardens the gooseberry; but in the smallest garden there is room for the raspberry, and for a home patch of strawberries. The black raspberry is not so easily grown because it must be frequently renewed. It is hardly possible to keep a patch of this berry longer than three or four years, while the red berry will hold its place three or four times as long, and give good crops. The blackberry may also be included, but had better be placed near the line of property, and used somewhat as a hedge. In addition to these we may admit dwarf apples and dwarf pears, with a few plum trees and cherry trees. Grapes are admissible even in the smallest grounds. They can be grown all over the house and the outbuildings.

There is no good reason why fruit trees and nut trees shall not almost altogether displace other trees on small homesteads. The English walnut, the American hickory, and the native chestnut are among the best English trees that we have for shade. They may as well occupy the ground as maples or elms. You may have your house in an orchard of pears or of apples, while these fruit-bearing trees or nut trees may line the street side. One of the handsomest trees for a small lawn is a crab apple, both in blossom and in fruit. The Dartmouth, and some other varieties, grow to be twenty-five feet high only, and their limbs droop charmingly till they touch the sod. For still smaller grounds such trees may be dwarf. The cherry can be kept low-limbed, and within narrow compass, as easily as a pear; and both of them make admirable borders for walks.

Our fruit gardens are no longer made out with fancy beds and walks, but are intended to be cultivated with horse-power. There is the argument of convenience for making the small fruit garden an adjunct of the orchard. The cultivator must be continually running until midsummer; and it is just as well to work orchard and garden together.

It is my conviction that most people undertake too many varieties. If we follow experimental work, as we should, we will soon have a large number of cross-breds of our own originating, to be cared for. If our small lots are adjusted to grow a balance for market, it is still advisable to keep our lists of varieties reduced to the most valuable sorts.

If restricted to a half acre, or less, one variety of raspberry for early, and one for late, will cover our possibilities. In the strawberry bed we may plant four or five of the most approved sorts. There will

also be room for sufficient grapes to cover the whole season. Where the position is favourable it is possible to adopt the espalier method, for growing a few trees, that might otherwise be crowded out. Peaches and pears can be trained along the south and east walls of the house, or along trellises, as easily as grape vines. It is amazing how much good fruit one may secure from a very small area. I have in mind a little plot of less than half an acre, from which the owner takes the fruit of a dozen Japanese and European plum trees; of twenty-five cherry trees, grown along the line of his property; two or three bushels of strawberries; all the raspberries, blackberries, currants, and gooseberries that his family can use; while two pear trees give him Bartletts and Anjous, for early and late. Every corner is made available for some sort of food product. The land is kept up to the highest tilth, by the application of compost. He does not buy an ounce of commercial fertilizer, but never wastes an ounce of homemade plant food. In Germany there are few families that own more than five acres, and there are many that own but one; yet they expect to make their living almost entirely from the working of the land by wife and children, while the husband takes his earnings from a workshop. These people come to this country, settle on little plots, in close neighbourhood to our large cities; and by family co-operation, not only win a living, but keep a growing bank account.

Of raspberries Loudon is one of the hardiest, while Cuthbert and Golden Queen often fail in New York State. Of the blackberries Ancient Briton, Eldorado, Snyder and King Philip are the hardiest. Nearly all currants are hardy, but there is little use in planting any excepting White Grape and Versailles. Our native gooseberries are but little more hardy than two or

three of the very best English sorts. If hilled up during the winter, I believe that Lancashire Lad and Industry will resist the most trying cold. The strawberry can be grown in a very cold climate by protecting with autumn leaves, over which may be strewn a good sprinkling of rich compost. In the spring rake the leaves into the walks between the rows.

California and Florida are working out their own problems in their own way.

I should like to add a word for those who have a city lot, but country longings. While living in St. Louis, with Dr. Magruder for next-door neighbour, we agreed to divide our energies, so that each should produce a different crop, and exchange products. It was a capital idea, and might be more often carried out in our cities. Each one of us had a lot fifty by one hundred and eighty. It was my business to grow garden fruits, and his to grow vegetables. Grape vines were trained not only over my walls, but along the line fences. I acknowledge that with them I grew lima beans, which I did not quite trust to my neighbour. It was not long before we had strawberries and currants and raspberries; and then peaches, apricots, plums and pears. From his garden we had the most delicious lettuces, radishes, beets, tomatoes, cucumbers, onions and eggplants. Where a city lot lies fairly open to the sun it can be kept fertile with the manure that is wasting in the streets; and be made to produce superb crops of vegetables and fruits. I do not see why every inhabitant of a city, who occupies a house and lot, may not at least have a strawberry bed; along the fence a few gooseberries and currants; and frequently all the plums and cherries that can be used — beside a surplus for exchange or sale. He should save all autumn leaves to make humus: anthracite-

coal ashes to losen the soil; and never allow street sweepings to be carted away.

But for all that can be done with a city lot, I still say go out into the country, if you can. There is no sense in wasting your earnings on rent; at the same time narrowing your privileges to a minimum. Out, out, out, where the air is free, and there is no land rent, and where the birds give concerts without charge. And the first thing you do plant a garden; a modest garden that will be sure of the best cultivation. With all the rest of the crops that it will give will be content and sleep.

CHAPTER TWO

THE CURRANT

THE currant in the small-fruit garden stands where the apple does in the orchard; it is a necessity. Our fathers so looked upon it two or three hundred years ago, and wherever they went they were sure to carry a few currant bushes. The old-fashioned currant of fifty years ago was small in size, but it gave heavy crops of well-flavoured fruit. It grew in spite of careless culture, and did not refuse to give a moderate crop even when neglected altogether.

All varieties of the currant like cool and moist soil; but not wet. When planted in wet soil the roots are heaved, and sometimes literally pulled out of the ground by the frost. This is a special matter, to be looked after with both currant and gooseberry — that there be no chance for the frost to work the plants loose in open winters. It is done by alternate thawing and freezing of the soil. My experience shows that the currant thrives best on strong clay soil; well fed by annual applications of compost.

The culture of the currant is simple, but it must be accurate. The cultivator should be actively at work nearly up to the time of picking the crop. I prefer fall plowing, turning the soil toward the bushes, and leaving it there till spring.

For market the red currants are most desirable, simply because of a popular whim. The white varieties are sweeter for table

use, and are equally good for jellies. The jelly from white currants is red, but of a lighter shade than that made from the red varieties. It is well to make a mixture of one-fourth red and three-fourths white.

The currant is easily propagated by division of roots, or by cuttings. For the latter, take in October new wood, that has been well ripened, cutting smoothly beneath the joint; and if possible leaving the cuttings about ten inches or one foot in length. These should be thrust into a well prepared bed, about one-half of their length. It is important to press down the dirt very tightly, and then mulch with coal ashes, or any other convenient material. It is well to have the bed in ridges four or five inches high, so that the water will flow away from the cuttings rather than settle about them during the winter. These cuttings should make good plants by the succeeding autumn.

I prefer two-year-old plants, although one-year-old will prove satisfactory, if watched with care. If compelled to plant one-year-olds, I stake each plant, simply to prevent the careless step of horse or stroke of hoe.

A currant plantation may be kept in bearing for twenty years or more, provided the old wood be occasionally renewed; and with some varieties it is essential to renew plants that become straggling in growth. I do not quite understand this freak, yet it is true that an occasional bush will refuse to grow in an orderly fashion. Replanting is not an expensive affair, and for this reason we must repeat the process, often enough to keep our fields at the height of possible yield. A good average yield should be at least two hundred bushels per acre. To secure this yield we must have the best varieties, in the best form of growth.

The currant is usually a healthy bush, but occasionally it is visited with a fungoid disease, which blights the growth, and devitalizes the plant. The borer sometimes makes serious ravages; the larvæ eating through the core of the stem. In either case I know of no remedy except to cut the stems and burn them. Once or twice within the last fifty years I have been compelled to practically destroy the bushes, for two years in succession. The most formidable enemy, however, known is the currant worm. It is hatched from a saw-fly, and beginning at the lower branches it soon strips the whole bush of its foliage. The work begins very early in the spring, and proceeds with great rapidity. This is the first insect that we have to fight in our fruit gardens. Spray at once with white hellebore, in a solution of Paris green. The arsenical mixture may be prepared about as for apples, and other orchard fruits. Be sure that the spray thoroughly permeates the bushes, touching the under sides of the leaves. Later applications, if any, must omit the arsenic.

The currant has this great advantage, that it need not be hurried to market. In cool storage the crates may be kept for four or five days, and still be in perfect condition. This, however, depends upon the picking and handling. Not a currant must be mashed, nor stripped from the stem. Pick each stem separately, and place at once in berry boxes or in shallow baskets. For your private customers invariably pack in crates. For a distant market they are generally sent in five- or eight-pound baskets. For a near-by market currant picking begins near the first of July, and continues into August. For the table we may have them even later. Just before the end of the harvest young orioles may make an appearance; if so a few bushes may be covered with mosquito

netting for protection. The price of currants varies altogether with the kind of customers you have. Large shippers are generally satisfied with three or four cents a pound. These currants are retailed at six or seven. I do not find any difficulty in serving private customers with high grade stock at eight cents per pound — and sometimes even more.

Among the more common of the older varieties of currants were Red Dutch and White Dutch; both of them small in size, but of fairly good quality. Later additions of note were Victoria, a valuable red, and Prince Albert, most notable for very late ripening. There was little difference in the productive qualities of these currants, although that notion was very generally exploited by nurserymen. The difference in the bearing depended mainly on the culture. The origin of Cherry currant is in doubt. It caused considerable interest, and was very widely planted some forty years ago. The bush is a very upright grower, on woody stalks; and unless constantly renewed, the canes are very poor bearers. This currant, however, proved to be of great value for producing cross-bred varieties. Mr. Fay originated a seedling of the Cherry, about 1880, which was sold at one dollar a set. Within a few years it had brought a nice little margin of nearly thirty thousand dollars to Mr. Fay, and a like sum to the disseminator. This Fay currant was a beautiful sort, large and prolific; but it was really no larger nor any better than the Versailles — a much older variety, that somehow had failed to win the attention of the public. However, the Fay currant was very valuable, because it drew attention to improvements in currants and currant culture; and the possibility of displacing older sorts of inferior quality.

Almost unperceived, there had come into the possession of

fruit growers, a new white currant, called the White Grape, with all the good qualities of all the old varieties concentrated in one. No other currant could compare with this as a dessert fruit.

Within the past few years quite a number of new sorts have been offered the public, but so far it is questionable whether we have anything superior to Versailles and White Grape. Among the best is London Market. This is an upright growing bush, exceedingly productive. The stem of berries is very long and compact. The Red Cross is a vigorous grower, and very productive of large and handsome bunches. It is claimed that the fruit is larger and sweeter than Fay. If so the distinction is hard to draw. Chautauqua has been introduced as a climbing currant, growing from seven to ten feet high. Nearly all of the currants may be grown after this manner, in rich soil, if headed to two or three canes. A climbing currant, if it could be produced, would be of no special value. This variety is said to contain fewer seeds than some of the others, and to be peculiarly sweet. Pomona has a good record, as bearing a heavy crop of fruit; easily picked and having few seeds. There certainly is some difference in the varieties in the matter of seeds; and we may hope as we increase the size to decrease the seed production. White Perfection is a new variety very highly commended by good judges. The size is about that of Fay, and a trifle larger than White Grape. It is much like White Grape in quality; that is rich, mild, subacid, and having few seeds. Comet originated in England, where it has the reputation of being at the head of all red currants. The Royal Horticultural Society gave it an award of merit. The stems of fruit are said sometimes to be eight inches in length. From all that I can learn of this variety it is the most promising new sort.

The Wilder has gained notice as one of the strongest growers and most productive. It is about the size of Fay, with a longer bunch and a milder flavour.

Among my own seedlings I find several varieties of great promise. One bears a fruit equal in size to Versailles and Fay, and fully as prolific. In fruit there seems to be very little gain; but the bush is much stronger, standing when full grown from six to seven feet high and one-fourth larger than Fay and Versailles. In the bearing season it is a magnificent sight.

Other varieties are offered the public, but it is hardly worth the while to experiment with them unless they can show some decided progress. What we are to look after is a currant about double the size of Fay, on a bush considerably larger and firmer. This new currant should have the rich flavour of White Grape, and be free from the tendency to scald, which is characteristic of some of the new sorts. At the same time we should aim to reduce the number of seeds. Instead of introducing new sorts which are very closely like the older, we must wait patiently until we have been able to get nearer our ideal.

Black currants are very popular in England, but in this country have secured very little attention. Their treatment does not differ from that of reds and whites. The two varieties most called for are the Black Champion and Black Naples. Black Victoria is mentioned by some as being the best variety, both in bush and berry — the largest black currant in cultivation.

CHAPTER THREE

THE STRAWBERRY

THE strawberry is typical of the humblest branch of the Rosaceæ family; but it has made humility popular. Everybody likes the berry, and the market demand is constantly on the increase. Those who remember in the fifties, the small consignment of strawberries that reached New York City, mostly to be hawked about the streets, remember also how small and how sour the samples were. The Wilson, or Albany Seedling, and the Hovey's Seedling were among the first to be cultivated in American gardens — somewhere about the thirties. They were marvels in their day; and the Wilson is still under cultivation — because of its remarkable shipping qualities; but it is so very acid, as to be unfit for dessert use, although one of the best for canning.

The strawberry developed rapidly about 1860, when Green Prolific was largely planted, soon to be followed by Crescent. Horace Greeley offered prizes for the best varieties; but the successful berries were soon surpassed and forgotten. Cumberland Triumph and Sharpless caused more extensive planting of the strawberry for market. The Sharpless was the first of the huge berries to be developed, and it wakened the ambition of growers to displace the old sorts with superior seedlings, and our markets are now full of strawberries even larger than Sharpless, of better quality, and vastly more productive to the acre.

The strawberry takes kindly to any good garden soil; but some varieties thrive best on clay, and others on sand. The Sharpless is an illustration of a variety that is very inferior on sandy soils, but high flavoured on clay. While selecting varieties for your garden you must consult the whims of each sort, to determine those which will do their best under the conditions that you can offer. Every one who grows strawberries, knows how discouraging it is to get a generous bed of some popular sort nursed through its first year, and ready for bearing, but find it flatly refusing to yield a decent crop.

One of our best strawberry growers tells us he considers good potato soil to be good strawberry soil; and he generally puts these two crops into alternation. A small garden should be worked over with a digging-fork. Lay off the rows to allow a hand cultivator to work between, after they have widened to about one foot width. For a larger field keep the rows far enough apart to be easily worked with horse cultivator. The runners will in a short time occupy every inch of space between the rows, if not guided in their growth or removed. The rows should be set at least four feet apart to allow considerable room for the runners, and leave enough for the cultivator. In the row, set the plants fifteen to eighteen inches apart. With a little direction and supervision the runners can be made to follow the line of the row, until it is thoroughly well filled with plants. This is called the matted row system. Those who prefer the hill system must set their plants two feet apart or more, keep the runners cut off, and the hills well hoed. This is the ideal system for some varieties, and where there is plenty of labour to be spared for the garden.

One of our best growers tells us that he would prefer a dark

sandy loam, rather damp than dry. The richer the soil the larger the crop, hence the necessity of extra manuring. For spring dressing this grower prefers wood ashes. If unleached, they should be applied not less than fifty bushels to the acre. Twice that amount should be used if the ashes have been leached. If ashes are not to be had, put on well-rotted stable manure, at the rate of about twenty wagon loads per acre. My own custom has been to apply a thoroughly decomposed compost, made of barnyard manure, coal ashes, autumn leaves and all sorts of refuse, with more or less lime ; comminuted very finely late in the fall. This is used for a double purpose. It is placed quite freely over the beds as covering, and at the same time it constitutes a fertilizer. It is not removed in the spring, but if it lies too thickly, is raked gently away to the open spaces. One Experiment Station recommends five hundred pounds of cotton seed meal, one thousand pounds of acid phosphate, and two hundred and fifty pounds of muriate of potash per acre — to be applied late in the fall. In the spring nitrate of soda can be applied, at the rate of about one hundred pounds per acre. But whatever fertilizer is used, we may be sure that the best plan is to have the ground in fertile condition to begin with. If we use potato ground, which has been heavily manured for several years, it will be in just the right condition to carry the strawberry crop over a couple of years.

The strawberry is a lover of water; and for this reason soil that is capable of taking in and retaining water is ideal for this plant. No other of our cultivated berries has roots that are so short, and that so incessantly need showers or irrigation. Where showers are fitful some sort of irrigation becomes a positive necessity. No other crop gets so near to the fulfilment of high promise, and then under

a few days of drying sun makes a disastrous failure. The Wisconsin Station reports that a crop on which no rain had fallen for eight or ten days doubled its yield through thorough irrigation. The fruit on the irrigated rows was nearly twice the size of that on non-irrigated. It was also found that later irrigation brought about the growth of much more vigorous plants in the fall. The water was distributed through the fields in a series of V-shaped wooden troughs, made of inch boards set at right angles to each other. Water was permitted to flow out of the troughs through auger holes placed near the bottom. Escaping from these holes, it ran in small streams, conducted on either side of matted rows. The Michigan Station recommends sub-irrigation, by placing a line of tile underneath the rows of berries. The tile should be deep enough to escape the cultivator and the plow — not less than two and a half feet below the soil. When irrigation becomes necessary, the lower outlet of the tile is blocked and the water turned in, sufficiently to keep the tiles full, in addition to what soaks out into the soil. Three-inch tile is recommended for general use. This plan seems to be the one most easily put in operation on a small home place.

But whatever system may be adopted for supplying water, our chief attention must be paid to the retention of moisture supplied by nature. This can be done most effectively by continuous running of the cultivator. In this way the surface soil is made continuously to act as a mulch, to prevent the escape of moisture from below. At the same time a loose surface absorbs a very large amount of moisture from the air — especially at night. For a small garden bed which cannot be systematically irrigated, water can be supplied effectively by hand. In this case a small hole should be

dug by the side of each hill, or every two feet in the row. Into this should be poured, slowly, not less than one or two quarts of water. When this is absorbed, draw over a little dry earth, to prevent evaporation; bear in mind that a trivial supply of water will do more harm than good. On no account sprinkle a strawberry bed, unless you can keep it frequently sprinkled, and so thoroughly as to saturate the ground. Sprinkling, as ordinarily applied, does much more harm than good. It does not moisten the soil beneath the surface, and is followed by caking. As soon as the surface is in this way made hard, moisture cannot be absorbed by it.

Strawberries may be planted early in the spring or early in the fall. Planting in August generally requires so much attention as to be ill-advised. The plants should come from beds set the previous season. Old plants rarely make a good set. Spring planting must be generally recommended, because most growers will find that fall-set plants require so much attention in the way of covering, that their beds will be liable to fail. All strawberry beds require some sort of winter protection, but newly-set beds must be very carefully covered. After having used sawdust, cut straw, and autumn leaves, I have at last settled upon a plan of applying compost.

A strawberry bed is generally renewed after the first heavy bearing. There are, however, methods whereby it may be profitable for a series of years — especially a small home bed. If kept entirely clean, the matted row may be neatly turned under with the digging-fork in the summer, leaving the runners to form new rows in the spaces between. The old and exhausted plants are either turned under or thrown out. The cultivator will run next year where this year were the matted rows. Considerable care

must be used not to let the new runners make the new rows too compact. Go over them with a pointed hoe, and pick out superfluous plants.

In the selection of varieties we have always to bear in mind that many of our best sorts are pistillate, and cannot pollenize themselves. These imperfect berries include some of our very finest varieties, and when used must have neighbours to furnish abundance of pollen. Even the pollen-producers differ much in the amount furnished. Some, like Crescent, can barely take care of themselves.

While setting plants is always a matter of nice care, the setting of strawberry plants requires skill and precision. When thoroughly settled in the ground, the plant must not be either on a hillock or in a hollow, but just on a level with the surrounding dirt. In making the hole to receive the roots, be careful not to make it too large; spread the roots around a knoll in the bottom of the hole; crowd the dirt tightly about the roots, pressing from outward as well as downward; and then leave the surface earth loose. A well-set bed presents a tidy smooth appearance, and every plant looks as if it had grown where it stands.

Picking the strawberry requires nice handling, and if the grower desires to hold his market the berries must be carefully sorted. Large growers must seek large and distant markets; but a small grower should aim to produce only the choicest fruit, and carry it directly to the consumer. In this way the profits go to the producer and not to the middleman; and at the same time we are getting rid of shiftless culture, and bad habits in the way of marketing inferior stock.

If you are about to make a home in the country, or propose to

make a specialty of fruit growing, go slow in planting large areas of strawberries. No other of the small fruits requires as much experience and care and labour. I have seen several strawberry bankrupts. The berry has a faculty for arousing the enthusiasm of half-way people. This breed of cultivators cannot manage a fruit that makes such demands on patience and "throughness"—(Anglo-Saxon for thoroughness.)

In the selection of varieties we have to take into account what I have suggested already, that varieties vary in all their characteristics in different localities. L. H. Bailey in his work on "Plant Breeding" says, "Of all the fruit plants the strawberry runs out soonest, and the varieties change the oftenest; because a new generation can be brought into fruit bearing in two years, while it may require a decade or more to bring a new generation of apples or chestnuts into bearing. Yet my reader will remind me that the Wilson strawberry has been and is the leading variety in many places for nearly forty years; to which I reply that the Wilson of to-day is not necessarily the same as that introduced by James Wilson, simply because the name is the same. Every different soil or treatment tends to produce a different strain or variation in the Wilson strawberry, as it does in any other plant; and every grower when setting a new plantation, selects his plants from that part of his field which pleases him best — rather than from those plants which most nearly correspond to the original type of the Wilson. It is not surprising, therefore, to find strains of Wilson strawberry which are as unlike as many named varieties are; and it is to be expected that all of the strains now in existence have departed considerably from the original type." With this consideration ever in sight, the following list of strawberries

may be offered, as including most of the varieties worthy of consideration.

Arnot — This is a late-ripening berry, preferring light soil, and yielding heavy crops of good-flavoured berries. It is very productive.

Auto — This variety is getting a good deal of attention as a very large fruit, growing on a very stout plant; while the quality of the berry is delicious. The plant is of the very highest productiveness.

Beaver — One of the latest introductions, and a product of the skill of Mr. J. E. Beaver, who has originated some of the finest varieties. The plant is represented as a strong grower, and perfectly healthy. The blossom is perfect, and the plant a prolific bearer. The fruit not the largest, yet large and uniform in shape and size. In quality it is unsurpassed.

Brandywine — Is large and very productive, of excellent quality — dark glossy red to the centre. The plant is healthy and vigorous, and generally produces abundantly. With me it has not been as productive as with others.

Bubach — This berry that has held its own for about twenty years; and it shows no signs of losing its place, either for home use or for market. The plant is large and stocky when well grown; and the berry is of fine form, colour, and size, while the plant is of unsurpassed vigour and productiveness; all in all, the Bubach is deserving of its very general popularity.

Climax — Is a superb plant, ripening very early, while very productive. As a very promising, very early berry, it is likely to take its place among the best. It is highly recommended from the South.

Clyde — An exceedingly good berry, if grown in very narrow rows; valuable as a first-rate pollenizer, especially as it is one of the early sorts to blossom. The berry is too sour for home use.

Challenge — One of the recent introductions, and is proving an excellent sort to resist drought; is productive, has good form, as large as Bubach, bright in colour, and has both firmness and quality.

Commonwealth — A new variety from Massachusetts; and those who have tried it speak of it in the highest terms. J. J. H. Gregory, says that he saw a quart box filled with fourteen of the berries. It is a great cropper, and hard-fleshed enough to ship well. It is very late in ripening, covering a long season.

Crescent — An old, well known variety, still largely planted; but of medium size, although vigorous and very productive.

Cumberland Triumph — Another very old sort, that cannot yet be dismissed. It is seldom planted nowadays, but its blood, like that of Sharpless, is in some of the very best of our modern berries. The fruit is of beautiful form; large enough, and very sweet. The plant can take care of itself under neglect as well as any I have ever seen.

Duncan — A berry found wild in New Jersey. It has been tested sufficiently to make sure of its position. The plant is perfectly healthy, and the fruit is dark red. A very promising variety.

Gandy — Has held its own for many years, and is gaining in favour. One of the latest to ripen. The plants are very healthy and vigorous.

Gibson — This is recommended very strongly in some parts of the country, but does not secure uniform commendation. The

plant is healthy, and the fruit large, of good quality, and a dark red. Some growers rank this variety almost at the head of the list.

Glen Mary — Has won a high place in every part of the country; large to very large, a rich deep red, flavour sweet and rich. Ripens medium to late. The plant is one of the most productive; but the fruit needs a near-by market.

Henderson's Great Ruby — Is recommended "for vigorous growth, remarkable productiveness, immense size, handsome uniform shape, deep lustrous crimson colour, and rich flavour." I have not tried the berrry, but I think it one of very high promise.

Haverland — One of the most prolific berries in existence, but the fruit is carried on rather feeble stems, that allow it to be easily soiled. Of medium quality, and medium size to large.

Howard, No. 2 — Ripens with the very earliest, has the shape of Bubach, but not quite so large; and is an enormous cropper.

Howell — A superb-looking plant; with fruit stems nearly a foot long, carrying great bunches of splendid berries. It will delight for home use; and is, I think, of high rank for market. It is a long rooter, and a fair plant maker.

Jessie — Originated at the same time with Bubach; large, handsome dark red; in some localities reported as a poor bearer, in others as being very productive. A good pollenizer for pistillate varieties.

Johnson's Early — This variety has been as well received, for general planting, as any of the new early sorts. The plant is a strong grower and thoroughly healthy. Size and quality about medium.

Kittie Rice — A new variety, and one of the most beautiful and promising. The plant is perfect in growth, and very productive.

In the row it stands sharply in contrast with most varieties for its luxuriant foliage. The fruit is of the largest; round, and a dark glossy red.

Lindenwald — A box of these berries was received by me in 1903, when the crop was a general failure; and it was a marvellous sight. I find it in my trial bed a splendid plant, with large stalks of huge berries, of splendid quality.

Lloyd — This variety was named Seaford, and is sometimes disseminated under that name. In every way a fine plant, and fine fruit — ripening medium early, very large dark red, of good quality. It is one of the long-season berries.

Lyon — Another very vigorous plant and exceedingly productive. The roots are very stout, and the plant very capable of taking care of itself. The fruit stems, however, are too short, so that the fine fruit is brought too close to the ground. The colour is bright red, flesh firm, and of good quality.

Marshall — Very large, and of superb quality — ripening early; but not among the earliest. The plant is very large and strong; but requires to be grown in hills, and with high culture, to make it show its best.

Mead — Is a new variety, originated in Massachusetts; perfect-flowering and a very robust grower. The leaves are very broad, thick and tough. The fruit is of fine flavour. It is a promising berry.

Michel's Early — One of the best very early sorts. Berries of fair size, round, and bright crimson, quality, while not of the highest, is good.

Miller — One of the recent introductions, and in every way a standard. It has long roots, while the plant is very stocky, and

very productive. The fruit is very large, roundish-conical, and of a bright red.

McKinley — One of the largest, and very excellent in quality. It makes strong, healthy and productive plants. Berries are dark red, and of fine form, ripening in midseason.

New York — A recent introduction, and a prize berry. The plant is large and healthy; but it needs high culture and does best in hills.

Oom Paul — A new variety, a large healthy plant, and a prolific bearer. The fruit is large, and holds out through a long season. With good culture this ought to be one of the best garden berries.

Palmer — Very early and very productive. Like all the early sorts it varies a good deal in different soils. The berry is conical, and dark glossy red. With me it is not always well-shaped.

Parsons' Beauty — A remarkably fine grower, and an abundant bearer. The fruit is large; of excellent shape; and the colour bright red; unfortunately the berry is very acid; and fruit stems too short.

President — Professor Jordan, of the New Jersey Station, speaks of this as a most extraordinary new variety. It is one of the long-seasoned sorts, but not an early ripener. It is a splendid market berry, and just as good for home use.

Rough Rider — This variety is from some localities reported to be enormously productive, of large size berries. Good pickings are said to be made as late as August 1st, in Northern New York.

Sample — One of the berries that has not failed, so far, in a single section of the country. The plants are very strong, large and healthy; producing a heavy crop of large dark-coloured berries, of uniform size and colour — while they carry well.

Senator Dunlap — One of the grandest berries recently introduced. It has taken a place among the great standard sorts. The plant is strong and healthy, a rampant runner, and takes good care of itself. The fruit is not quite the very largest; but of regular form, a bright glossy red, very firm, and a splendid keeper and shipper. It makes one of the best canning berries. It not only ripens early, but continues through the whole season.

Sharpless — This old variety is so very good on clay soils, that it cannot yet be overlooked. Unfortunately, on sandy soil it is poor. The berries stand on long stalks that sometimes fall over.

Texas — One of the newer introductions; recommended for being very early, very productive, and of large size. It seems probable that this will be one of our very best and early berries.

Thompson's 124 — Superb in size; ripening early, but lasting long; very prolific, and one of the best every way.

Thompson's 503 — One of the noblest, sweetest, richest and best croppers I have ever tested — ripening late.

Thompson's Mark Hanna — This is the biggest and best new berry of which I have personal knowledge — a marvellous product. In shape and colour and size, it is a wonder.

Warfield — Pre-eminently a market berry. Plant vigorous, and productive of berries quite uniform in size, but not the largest. It is, however, too acid for many people. As a market berry it is crowding the Crescent very closely.

Warren Seedling — One year's trial of this berry proves it to be very large, bright in colour, excellent in quality, and giving some very late pickings. I cannot yet recommend it for general planting.

Wm. Belt — One of the noblest strawberries. The plant is very

vigorous, and carries heavy crops without extra culture. The berry is large, handsome, and of very good quality. One of the varieties that keeps in bearing for a long period.

Wolverton — This is a noble plant, and produces heavy crops. It is also a good pollenizer for imperfect varieties. It has a good reputation all over the country. The fruit is bright red, the berries very large, and the crop enormous.

Yant — An ideal berry in growth and productiveness. The plants are very large and the abundant fruit is of good size.

Beside these Mr. M. T. Thompson has produced a lot of most remarkable seedlings, concerning which I shall allow him to report for himself — all the more because he is one of our plant enthusiasts, who loves creating better than making money from his creations. He says: "I think I have some wonderful fine berries; but Nos. 1, 2, 3, 4, Mark Hanna, and Beidler are among the best. My No. 2 is the most handsome and nearest perfection. Its quality is fully equal to its size, colour and productiveness. For a late firm berry I prefer Warren's Seedling, owing to its productiveness. It is a pistillate; so also is Mark Hanna; but No. 2 is a staminate, and a good pollenizer for the others." Mr. Beaver is another of our remarkable strawberry growers and breeders. He has given us, among other superb sorts, Kittie Rice, Beaver, and Senator Dunlap. Mr. Thompson writes that when he desires to cross two varieties he simply plants them side by side. As soon as the blossoms begin to open, he covers them with a fine cheese-cloth, and every day for a week or two, he transfers pollen from one plant to the other. He then selects the finest berries, rubs them into sand, and sows the seed, at once, in small boxes filled with a rich compost, largely sand. These he places where they will be partly shaded,

until the small plants appear. These will frequently be large enough to transplant into the field by September. Each one must have a plot by itself; and care must be taken not to let the runners of different sorts get mixed. He often finds only one exceptionally good variety from a whole season's experiment.

I have asked Mr. M. Crawford of Cuyahoga Falls, Ohio, to sum up his almost unrivalled experience with new varieties, and old varieties; and tell my readers what three varieties he would select, as all in all the best to cover the season for a home garden. He replies: "The three strawberries that I would select for home gardens would be Senator Dunlap, Kittie Rice, and Latest; and I would select the very same three for market. Senator Dunlap is so healthy, vigorous and productive; so sure to succeed everywhere, with any kind of culture; and the fruit is so good and so beautiful that I would not leave it out of any collection. However, it must have growing room, or it will not be large. Kittie Rice is larger, in both plant and fruit, than Senator Dunlap; and just as sure to succeed everywhere. Latest has given us most satisfaction of all the very late sorts we have tested; but it has not yet been thoroughly tested — and may not be all that we think. Late varieties do not extend the season as much as one would anticipate. You ask my opinion concerning seedlings that are annually tested. Not one out of fifty of those that we receive and put on trial, proves worthy of introduction. Among some of the newer sorts that are now in our trial beds, I expect much from Peck's 99; Victor; Nehring's Gem; and Mrs. Miller. Beaver is best of all in quality; and Cardinal seems to about fill the bill every way."

A list recommended by one of the highest authorities, as adapted to the South and Southwest, includes Parker Earle — an old

variety, remarkable for its productiveness. The main point, however, with this berry is that it endures extremes of heat and cold. In our Northern gardens it is large, fine and handsome, but it sets a great many more berries than it can perfect. The flowers are perfect, and the product per acre enormously large. Mr. Munson names Bubach as one of the most successful berries in Texas; also Michel's Early — which is there the earliest berry, as it is here; and a fine pollenator for other sorts. Crescent and Challenge do well everywhere; and are spoken of as specially good for the Southern States. Hoffman is an old sort, that has been dropped out of Northern culture, but is still extensively grown in Kentucky, Virginia, and Texas.

In the states of Arkansas and Southwestern Missouri, mainly following the line of the Ozark Mountains, there are six thousand five hundred acres in strawberries. They will ship at least fifteen hundred car loads in a single year, besides a very large express shipment. Crates are shipped by express as far as New York, Philadelphia, and Boston; beginning as early as May 10th. The returns to the growers in those two states are very nearly two millions of dollars annually. The average income per acre is about one hundred and fifty dollars; while the cost of cultivating and picking absorbs one-third of this. These strawberry lands can be purchased for about fifty dollars per acre. Of course there are exceptional cases, where the profits are much greater. The tendency is to intensive culture of small farms. The labour required and the careful oversight demanded, make it impossible for one man to care for more than a quarter section. The ranges run from ten up to eighty acres; occasionally, however, growers count their acres by the hundred. One farm of three hundred and sixty

acres yielded a gross value of one hundred thousand dollars in 1903. Everywhere there is indication of thrift, but still more there is evidence of precision, skill, and the application of scientific methods at every point — both in the cultivating, the picking, and the marketing. The harvest season gives employment to thousands of boys and girls, who are gathered from all quarters, and go home with money enough to clothe and school themselves through the winter. In some cases young girls will earn five dollars a day with their nimble fingers.

An expedient for protecting strawberries from birds, and frost, and drying of the soil, is being tested at some of our Experiment Stations. The New York Station reports that it is possible by shading, to grow larger berries, of better quality, and in some cases, of better appearance; but that the berries are no earlier, while the quantity of fruit is generally decreased. There seems to be a tendency to send the vitality of the plant into excessive growth of foliage, which to some extent decreases the quantity of fruit. Shading is done by means of a cloth, attached to stakes at the sides of the area to be covered. Other stakes are placed in the beds, and on them wires stretched. Thin cheese-cloth, commercially known as Bombay, is generally used. The cost of shading is estimated at about three hundred and fifty dollars per acre. After the covering had been placed over the beds in 1902, severe frosts occured, sufficient to kill foliage where it was unprotected; but that beneath the sheets was entirely uninjured; nor were the buds of the fruit injured to any serious extent. The most careful count of blossoms showed about eighty to ninety per cent of the unshaded buds frosted, while from six to eight per cent only of those shaded were injured. The air under the cover was more humid, evapora-

tion was checked, and the moisture in the soil conserved — but not to the extent anticipated. In fact the effect on the moisture of the soil by shading is considerably less than that wrought by constant running of the cultivator — or by mulching.

From the very useful and practical hand-book on "Strawberry Culture" by Crawford, I take a few passages which are of special value for their pithiness: "The strawberry is a cold-blooded plant, and is never at its best in a very warm place. A northern slope is more favourable, other things being equal, than a southern one. Land that has been grass within a year or two is to be avoided, on account of the probable presence of white grubs in it. So also is land that has been in strawberries within a year, liable to contain insect enemies or rust spores. The best results cannot be secured where water stands for weeks within a foot of the surface, during the growing season. People are not generally aware also that large trees near a strawberry bed are very injurious, on account of the water they take from the soil. The ideal preparation is first to drain and grade the bed, in the fall. Then cover the surface with manure; and in the spring rake off all trash; and then make fine the soil to the depth of six inches. . . . If one has any doubt about the fertility of land, in the spring, just before the plants come into bloom, apply a few hundred pounds of a good fertilizer per acre. Two hundred pounds of nitrate of soda, when about half the fruit has set, will add to the crop and to the luxuriance of the plant. I am satisfied from long experience that a good coat of manure applied in the winter is one of the best methods to get a good crop of strawberries. Lime should never be used on land for strawberries, nor a very large amount of unleached wood ashes." Mr. Crawford makes a great point of stirring the soil, by constant

cultivation, in order to preserve moisture. It has been ascertained by careful experiments that twenty-five tons of water are evaporated from an acre, every bright day, where it is uncultivated; but most of this is preserved by keeping the surface loose.

Among the more troublesome enemies of the strawberry are the larvæ of the "May beetle" or "June bug." This grub lives in the ground for two years, and emerges on the third. They are chiefly destructive just before transforming into the completed beetle. Fortunately the appearance of this grub is considerably modified by conditions. Some years the emerged beetles find it too cold weather to fly and copulate. When they appear in full force, the destruction wrought by the larvæ in strawberry beds and grass plots, is as severe as the work on our trees by the beetle is mutilating. No device has yet been discovered or invented for seriously interfering with the work of either the beetle or the grub. The chief enemy of the grub or the larvæ is the common ground mole. These will be found exceedingly numerous during the winter previous to the emergence of the grub. Let them alone. When this grub has done its work the plant is literally eaten off, and can be lifted without pulling. When at their worst, and conditions are most favourable, we can lift our grass sods by the square foot in the same way.

There are several strawberry borers and root worms; the worst being the crown borer. This is a member of the curculio family; and the grub when hatched, eats its way into the crown, where it tunnels until the plant is destroyed. The only way to circumvent this class of pests is to change your beds frequently, and destroy affected plants.

A strawberry weevil is particularly troublesome in the Southern

States. It is described as a small black beetle, which attacks the buds and the blossoms — destroying the stamens of the bisexual varieties. White hellebore and kerosene emulsion is recommended as a remedy. The object of this weevil is to reach the ovary — for this reason it is said that the pistillate varieties are seldom attacked. The tarnished plant bug is described in one of the Station Reports, as a bug about one-fifth of an inch long, half as broad, and elliptical in shape. The head is black or reddish; while the body is dark brown to yellowish, and the underside is lighter. The adults hibernate under rubbish until warm days, when they commence their destructive work on the leaf buds. Several broods are brought out during the summer, destroying the tender shoots and fruit — not only of strawberries, but of other fruits. The best remedy is said to be pyrethrum, mixed with four times its weight of common wheat flour; and applied with a bellows.

The strawberry leaf roller is known everywhere as a small yellowish caterpillar, which feeds on the leaves and causes them to roll up tightly. The remedy is kerosene emulsion; applied early, so that the oil will not affect the berries.

For all fungus diseases, such as rust, leaf blight, etc., there is the general remedy of Bordeaux mixture. This should be sprayed on the young plants as soon as growth begins; and the application frequently repeated. My own custom is to begin spraying very early in the spring, at the same time that I apply Bordeaux to all my trees, bushes, and vines. This is done just before buds start on the apple, and cherry; and it is done very thoroughly. I consider this one of the most important applications of Bordeaux that can be made at any season. My experience leads me more and more to the conviction that our severest fight, both in the fruit garden

and in the orchard is against fungoid enemies. We may sum up this subject then, briefly, that the chief protection against insect enemies of the grub sort, is the burning over of old beds; and their very frequent removal to other parts of our property; while the chief protection against fungoid diseases is in a thorough application of Bordeaux.

CHAPTER FOUR

THE RASPBERRY

THIS name is applied to that branch of the Rosaceæ berries in which the fruit separates from the receptacle; entirely unlike the strawberry, in which the receptacle becomes the eatable portion. There are three varieties in our gardens—the European, the American, and the Occidental or black. The difference between the American and English is very slight, except in the fact that our native is much more hardy and productive. The red raspberry, including the shades of pink and yellow and white, is the housekeeper's fancy. The demand for it is always enormous, and increasing. Owing to difficulties in sustaining gardens the supply is very generally less than the demand, making raspberry growing very profitable. For another reason it is a good garden market fruit, because it comes into fruitage very promptly, and very surely. Any one beginning a country home, near a market, and wishing immediate profits, will find no berry more likely to meet his needs than the red raspberry. It will not bear very distant carriage — certainly the best varieties will not — and for this reason the grower will not find himself compelled to compete with stock from distant states, and from the South.

The raspberry will grow in all soils, but it prefers loose and well-cultivated clay. It must not, however, be overlooked that the

THE MARKET DEMAND FOR THE STRAWBERRY IS CONSTANTLY ON THE INCREASE

THE DEMAND FOR THE RED RASPBERRY IS ALWAYS ENORMOUS

varieties of this plant are sharply individualized. Some of them dislike exactly what the others prefer. The Cuthbert prefers to grow in solid rows, while such varieties as Turner insist upon hill culture; and will give no returns worth the while without it. In all cases the land where raspberries are to be grown must be thoroughly drained. It is also desirable that there shall be a very large amount of humus. I have not found that a free addition of barnyard manure will serve either as a good fertilizer, or to increase the proper humus. On the other hand it is liable to encourage the development of diseases — especially root gall. I should prefer a very liberal application of autumn leaves, to serve as a mulch and sort of cover crop during the winter; to be plowed under in the spring. This is the natural fertilizer, supplied by nature to the bush in its wild state.

I prefer to plant both the red raspberry and the black in the spring, simply because the land is then most under command. In the fall, if your land is very clean and in excellent tilth, the red sorts may be set with safety. It makes very little difference whether the plants are set deep or shallow — better deep. The black raspberry on the contrary must always be set in the spring, and very shallow. The reason for this is that the black variety roots from the tip; forming a tuft of leaves and buds, and these must be left uncovered in planting. In all cases crowd the dirt down very tight, and toss loose dirt over the pressed dirt as a mulch. If you have a good compost pile, made of refuse, coal ashes, and some admixture of barnyard manure, you will do well to make a surface dressing. The Cuthbert and similar varieties, indeed nearly all of those in cultivation at the present time, should be set about one foot apart. The Turner

and a few of the very delicate sorts should be set about two feet apart.

A raspberry field will show its tendency to suckerage, by filling all the space between the rows — which should be at least three feet apart — with young shoots. What you want is a good solid row of new canes. Run your cultivator through and through, to destroy the superfluous shoots, and to keep the ground in clean tilth. An old established field must be cultivated from plowing time until picking time; in fact, cannot be too often loosened up with hoe and cultivator. The canes that are superfluous in the row can be taken up for sale, or for planting new gardens.

Trimming and care of a red raspberrry garden consists in cutting the canes out that have borne; and this should be done soon after picking. You will then cut off the new canes, leaving them four or five feet high. It is desirable not to do this part of the work until growth has ceased, in October. Fork out the waste rubbish, and burn. Now it remains with you to decide in what way you will keep the canes from being broken down by snow during the winter, and out of the way of the plow when it is used. After considerable experimenting, I have adopted a system of double wires, between which the canes are placed; after which the wires are clamped together at intervals. These wires should be stapled to stakes at the ends of the rows, and to other stakes placed about every twenty feet in the row. When the work is done your garden is very neat and tidy; the canes are upright, and will remain so through the winter — even if the snow be heavy. The ground is ready for fall plowing in October or November, if you decide that it is desirable.

There is a cross between black and red berries, in which

class we find the Columbian and Schaffer, giving very large purple berries, with distinct flavour. These differ from the ordinary red, in the growth of the bush, and they must be planted on an entirely different principle. The plants of Schaffer should be at least three feet apart, better four or five. The canes can be placed between wires during the winter, but during the summer they must have more liberty for spreading. It is well to manage each cane separately — sometimes tying to wire, and sometimes to a stake. The yellow raspberries vary largely like the reds, both in quality and in style of growth.

If the winter has been very severe and killed back the canes, so that the buds start feebly, it is better to go over the raspberry field once more, in the spring, with shears, and cut back the canes, sufficiently to remove the weaker buds, and concentrate fruitage energy below. In this way you will sometimes secure a very excellent crop; while if not thus cut back, you will get a large lot of seedy and worthless fruit.

The growth of blackcaps must be checked by nipping off, whenever a cane has grown about eighteen to twenty inches. This pruning must continue as long as the growth continues. The object is to produce a solid thick bush, well armed with fruit-bearing limbs. I do not find it possible to keep a field of black raspberries in bearing condition for more than three or four years. The propagation from tips is also a bother to the ordinary grower, and he will find it desirable to leave this work to nurserymen. The fruit of the black sorts is very much loved by birds, and as a consequence bird-sown varieties will spring up everywhere about our gardens and fields. Among these I have secured many very remarkable sorts; it is difficult, however, apart from a nursery, to propagate

and perpetuate these. When you get something that you are sure is very fine, send it at once to a nurseryman to be cared for.

Black varieties are subject to cane rust. When this occurs it is best to dig up the plant and destroy it. I find that seedlings from the hybrids are especially likely to develop this rust. Red raspberries are mostly damaged by cane borers, and by root gall. Anthracnose is sometimes very troublesome. When cane borers appear, go through your fields and cut off the canes below the ring of eggs, and destroy them. This work must be done very promptly in the summer. For root gall I know of no remedy except to dig up and burn. This destructive mischief is just now greatly on the spread in raspberry fields, in many sections of the country. It is dragged about with the plough.

In cold climates, as in Wisconsin and Iowa, the problem remains of winter protection. It hardly seems profitable to grow large fields by laying down the canes, and yet I am told that it pays well. To do this the soil is loosened on one side of the plant, and the canes are bent over in the line of the row, so that the top of one plant will lie on the roots of another. We are still in hopes of developing a thoroughly hardy and first class raspberry. This will come through a free growth of seedlings. What we now want is an iron-clad cane, bearing a bright red berry, and one as large as the Cuthbert; and in quality better.

Among the best varieties now in cultivation, we have from the foreign stocks, Clarke; a large and light red berry, productive and hardy, and of the highest flavour. This is one of the best red raspberries for home use. Herstine is another of the best-flavoured berries, large in fruit, bearing abundantly, and moderately hardy. Hornet is a French variety, bearing on a vigorous and upright

cane, and valuable for home use. Brinckle's Orange, an old sort, is yet one of the finest ever cultivated. The plant is tender, but in a small home garden it will pay to take care of it. Superlative is a very large berry, and very firm. I do not find it of any practical value.

Among the best varieties developed from native stock we have Cuthbert, sometimes called Queen of the Market. The berry is large, and of a rich crimson colour; the quality is only good. The dryness of the berry makes it a good shipper. This is still the standard sort to grow for market. Golden Queen is a seedling, or a sport, from Cuthbert — a large berry very much like its parent, only of a fine golden yellow. The plant is a little hardier than Cuthbert, and the berry astoundingly productive. The flavour is decidedly unique; though for canning it proves to be too watery — Loudon is said to be a seedling of the Turner, crossed with the Cuthbert. It is far more hardy than Cuthbert, while the berry averages larger, and decidedly richer in flavour. The canes are very productive, but not always as tall as the Cuthbert. Unfortunately this grand berry must be picked just as it is to be sent to market. It has no staying quality whatever. Twenty-four hours will turn it into mush. Marlboro, is, for an early berry, probably the best that we have. The berry is large and of good colour, and the canes are absolutely hardy. Miller, with me, has proved worthless. Of the purples I have tried many varieties, but find them all too dry, excepting Schaffer and Columbian. These berries are crosses of black and red varieties; and the seedlings from them will generally produce black sorts. The canes of both the varieties I have named are exceedingly stout, often growing twelve feet high in a season, while the load of berries produced is enormous.

Schaffer always kills back a good deal; but it never fails of giving a most abundant crop. In quality it is decidedly preferable to Columbian; although Columbian is possibly hardier in cane — while the berry is too dry.

It is difficult to give anything like an adequate list of black raspberries, because the favourites are constantly changing. The first very great improvement in black raspberries was the production of Davison's Thornless and the Doolittle. The former of these still crosses into our wilder stock, and should be encouraged to do so. Growers of seedlings will do well to allow the Davison to furnish pollen. The Doolittle is still grown largely as a good berry for canning and evaporating. The next marked step of progress was made by the introduction of the Gregg. This was a very remarkable berry in size, while the quality was excellent. Unfortunately the cane was not quite hardy. Gregg seedlings and crosses are among our best later improvements. Cumberland is a new sort, of Gregg blood, and said to be entirely hardy, and very productive. Palmer has the reputation of being one of the best early varieties; the quality good, and the canes very prolific. The berry is firm for shipping. Gault, is a large and firm berry, of rich flavour; while the plant is among the hardiest. This variety has gained a reputation for autumn-bearing. Eureka is another very early sort, very large and a glossy black. The quality is good. Nemaha is standing very high with growers in the Northwest. One Wisconsin gardener says: "It yields 150 bushels to the acre"— very large, very late, and firm. Of all those named, I should prefer the Cumberland for a midseason; and with it I would join Kansas, a very large and handsome and firm berry of the best quality. The cane is hardy and very productive. Perhaps to these for an

early variety it would be well to add Palmer, and Nemaha for late.

Among the newer varieties now claiming attention, one of the most promising Western berries is the Ransom — another everbearing. It is said to bear until cut off by heavy frosts. Haymaker is an Ohio seedling, of the purple sort; said to be an enormous producer, excelling all others. The berries are rather soft, but bear shipping fairly well; considered by good judges a decided acquisition. King is a new red raspberry, said by the Ohio Experiment Station to be the best early sort. The berry is firm, large and of a bright scarlet colour, ripening with the earliest. Cardinal, another new berry, is said to combine great growth, extreme hardiness, exceeding productiveness, and red, rich, and pure-flavoured berries. Brilliant is a new sort, very bright in colour and very prolific. The canes are said to endure twenty degrees below zero. Among my own seedlings I have an autumn-bearing red, which will sometimes give me a full crop in September. It may be desirable to make it the parent of an autumn-bearing stock. However, as a market fruit, we do not find that any of the berries are very acceptable out of their regular season. Other fruits claim attention in the fall, and even first-class raspberries have but a limited market. Is it possible to develop a raspberry that will not exhaust its canes by one year's fruitage? I have come across a variety that crowds this problem to the front. It needs several years more of testing before I shall be quite sure; yet it looks at present as if we had secured a berry cane capable of bearing fruit several years in succession.

CHAPTER FIVE

THE BLACKBERRY

THIS berry and the gooseberry, although long under cultivation, still refuse to be civilized. They insist on retaining their wild methods of self-protection, instead of giving themselves over to human care. The other fruits have aborted thorns; the blackberry is as barbed and distrustful as ever. This is due in part to the fact, that although we have long used the blackberry, and praised its qualities, we have until recently been satisfied with those growing in pastures and in wood-lots, where cattle browse. Nothing is so well prepared as the blackberry to defend itself against the cow's tongue. For a long while it was found impossible to make the wild varieties adapt themselves to garden conditions. And then in many parts of the country the wild blackberry was more delicious than the cultivated sorts. Even to this day I can find, in Missouri forest-edges, blackberries and dewberries that are so very good, that I must have good reason for doing severe garden work to secure a supply.

The blackberry came into cultivation about 1840, when an "improved variety" was exhibited before the Massachusetts Horticultural Society, named the Dorchester. It won considerable favour, but was soon displaced in popular esteem by the Lawton or New Rochelle. This last variety did not prove sufficiently hardy

however, and the fruit was frequently knobby as well as sour. Once in the garden, it became a very persistent plant, and to careless cultivators a real pest. A Lawton still throws up an inquiring stalk in one of my gardens, thirty years after I tried to eradicate it. After the Lawton, other varieties came rapidly, until now it is a poor fruit garden which does not have its blackberry patch.

The blackberry likes cool, moist soil — not wet; and it does not object to some shade. I have grown the Snyder for twenty years in the same soil, with only occasional composting; but the slope takes richness by surface drainage from above. I do not think that barnyard manures are desirable for either blackberry or raspberry. They seem to be provocative of disease. Sandy soil should be heavily mulched, to prevent it from becoming too dry. No other berry more quickly shows the effects of drought; the smaller varieties like Snyder, becoming mere knots of seeds. Kittatinny is a deeper rooter, and resists drying somewhat better.

There are two very distinct styles of blackberry canes. Some varieties stand sturdily erect; while others are sprawling; in some cases, as the Rathbun, rooting at the tips. The former are generally preferable for garden culture; as it is impossible to do horse work in a field sprawled over with thorny canes. I have, however, found that my blackberries, of the erect sort, when well established, and filling the soil, may be grown for several years without any cultivation whatever. I cut back the canes in October or later, and cut out the old canes at least before spring growth begins; but neither plow nor hoe them. This will do very well for several years; but you will find that your crop is gradually being reduced, and the canes growing smaller. This sort of work, or no work, is applicable to Snyder, Eldorado, and King Philip.

A properly cultivated field should show new canes, cut back when two or three feet high, to induce the growth of laterals. In this case the rows must be very narrow, the openings very wide, and the cultivator in constant use. A middle course is generally taken, merely cutting off the tops at about five or six feet in height, and leaving alleys open for the cultivator.

The chief enemy of the blackberry is a rust or mildew, generally called the Orange Rust. The infected canes should be cut out at once, and promptly taken to the bonfire. The cause of this rust has not been discovered, only we know that it is a fungoid disease. A borer sometimes puts in an appearance, but is not a serious pest, so far as I know.

Propagation of the blackberry is very easy, as it develops suckers all along the roots, and with great rapidity. Root cuttings also may be used, where it is desired to multiply a variety very rapidly. These root cuttings are generally made in the fall, and planted in furrows. It will do just as well if the plantation is made in the spring, only that the ground is likely to be in better condition in the fall.

One of the varieties that claim attention is the Agawam. The fruit is of medium size, jet black, very sweet and tender, and melting without a core. It is one of the very best for home use, only that the cane is not sufficiently erect and strong. It is, however, hardy and very productive. The Erie is said to be a remarkable berry, in size and quality, and hardiness. In this section it has very little to recommend it; as the berries are mostly mere knobs. The Early Harvest is one of the most valuable sorts where it succeeds, but it is not entirely hardy in the North. It is a good shipping berry, and an enormous bearer, while the fruit is medium

size, and of excellent quality. The Ancient Briton is an exceedingly hardy sort, and one of the best berries I have ever seen under cultivation. If there be a better sort it is the Eldorado. The canes of this variety are absolutely hardy, and the yield of large, jet black berries is immense. The fruit is very sweet, melting, without core, and a splendid shipper. I know of no variety that will keep better after picking. The Kittatinny is not yet supplanted, although a very old sort. It is a magnificent berry, slightly tart, but of the best quality when dead ripe. The canes are nearly erect, very strong and very vigorous. It has a tendency to give a second crop in the fall. Minnewaski is one of the largest, and best of the blackberries; juicy, sweet and aromatic; but it is not hardy in the North, as it is often represented to be. Ohmer is an enormous berry, and when thoroughly ripened is of fine flavour — classing among the acid sorts. It has been generally advertised as thoroughly hardy, which it is not. It generally manages to give us some fruit after a severe winter, but is utterly unreliable. Rathbun is a strong grower, but sprawling; and rooting, unlike the other blackberries, at the tip. I have not found it able to resist our severe winters. It is said by those who grow it well, to form a compact bush four to five feet high, producing immense fruit, in large quantities, of extra high flavour, sweet and luscious, with small seeds. The Snyder is our best known berry. It is an old variety, extremely hardy, enormously productive; but of medium size, and bad seasons it is all seeds and core. Taylor is a wonderfully prolific and vigorous plant, carrying berries of the finest flavour and quite hardy. It is, however, not as erect as the Snyder. Wilson and Wilson, Jr., are two superb berries, but both of them too tender for the North.

Among the more recent additions to the blackberry list we

have the Illinois, which is sent out with high commendations as large and sweet, while the plant is hardy. It still needs testing. A plant called the Maynard was sent to me some years ago; it resembles the Ohmer; but with a sweeter berry, and a plant considerably hardier. It sometimes, but rarely, kills back. The Kansas has been recently sent out with strong commendations. The Iceberg is the latest white blackberry to be produced. It is a good variety to be raised for home use, to be mixed with the black sorts on the table. As a market fruit it is of doubtful value. The Blowers' blackberry is one of the new claimants to favour, and if it proves to be hardy, will be a valuable addition to our list. It is enormously productive, and Mr. Blowers believes it to be able to resist even our severest climate. The King Philip is one of my own seedlings, probably from the Snyder. It differs from that in having yellow canes, of very strong growth, and in being somewhat better able to resist drought. On my grounds the three pre-eminently best berries are Ancient Briton, Eldorado and King Philip.

CHAPTER SIX

THE GOOSEBERRY

THE gooseberry has never been a favourite with the American people as it is with the English; but the market demand is increasing. We understand better how to grow the old world varieties, and we are developing much better sorts out of our native gooseberries. The bush is very hardy, but with many of the old sorts growers had a deal of trouble, because of mildew. It is now understood that the gooseberry will not endure either intense sun or damp soil and shade. Give it a position open to the air and sunshine, and yet not exposed to the most burning heat of midsummer, and the fruit is sure and perfect.

Budd reports that mulching gooseberries very heavily with hard-coal ashes has been thoroughly tested in Iowa, and that the result is very satisfactory — continued crops of large fruit without a trace of mildew.

In Central New York I find the best soil for the bushes a heavy clay, that has been lightened with coal ashes. If, however, I plant on knolls, where the sun scorches in July, the berries will sometimes roast on the bushes. In 1892 bushels were in this way cooked, and then dropped to the ground. Clay loam slightly enriched with commercial fertilizers, or with compost, is satisfactory. Before planting, work the ground very thoroughly and until it is perfectly

clean. It is not easy to get couch grass and some other weeds out of the gooseberry roots. I prefer to dig up a weedy plant, tear it to pieces, make it thoroughly clean, and replant the parts.

The gooseberry is our very first cultivated plant to expand its buds in spring. After this it does not like to be moved. I would therefore prefer to set in the fall, unless sure that my soil will be workable very early in the spring. I invariably mulch my plants, every fall, with a compost. But there must be judgment used in doing this. If too much rich food is piled about the plants, and the roots induced to feed high, they are pulled up by frost during winter. The compost should never make a mound therefore; and in hoeing, the workmen should be cautioned against too much hilling up.

The gooseberry is trimmed much like the currant; only remove less new wood. The old canes soon get to be woody, and without blossom buds; while these are formed freely on new shoots. This does not imply that there must not be a pretty thorough removal of the new canes. With these, however, each year, cut out the oldest of the old canes. Some varieties, like Columbus, require very little pruning; while Downing and most of our natives require a very sharp application of the pruning shears every autumn. At the same time, attend to shaping the bush, if it is a straggler. Some of our native varieties, if neglected, will sprawl upon the ground after a few years growth, so as to seriously soil the fruit.

For some time, in my garden, I relied upon Downing, Smith, Houghton, and New American. Then I began to collect wildings, and to grow seedlings. At present I have among these a rich red variety, a cross of foreign and native blood, that ripens July first; and another that extends the season late into September. These crosses are promising, and gratifying simply as experiments; and

I am sure that, if the work were general, we should get rich results. Of the English sorts Industry has attained a position of the most popularity. When well grown, it gives immense crops of large red berries. It seems to be less subject to mildew than most foreign varieties. Crown Bob is another sort quite frequently found in gardens. It is a large roundish berry, rather hairy, of a rich red colour, and of the highest quality. Whitesmith, a large yellowish white berry, and of the first quality, is also fairly well known in American gardens. Two of the very best sorts, in all ways for general culture in the United States, are Keepsake and Lancashire Lad. The latter is a bright red, and entirely smooth fruit; of extraordinary size and finest quality. The bush is a strong grower and bears heavy crops. The former is a straw-coloured berry of delicious flavour. The fruit is very large, and the crop is very sure. I believe this to be as good an English berry as we can plant in American gardens.

Of the native varieties there is a rapidly increasing number. Among the best is Chautauqua. This berry combines size, beauty, and quality about as well as any native. The fruit is large, bright yellow, and free from hairs and spines. The flavour is very sweet and rich. It is a thick-skinned fruit, making it quite portable for market. Columbus is, in my judgment, one of our best natives. The fruit if properly thinned, is of the largest size, yellowish green, and of superb quality. The plant is robust, and bears a heavy crop. I have never seen it mildewed. Josselyn — the old Red Jacket — is a large, smooth and very good berry — very popular with planters. It is a great cropper, and the growth is very clean. Golden Prolific is a hardy and good grower; bearing a large, deep golden yellow fruit, of excellent quality, and very beautiful. Of the older sorts perhaps the two best are Smith and Downing; both

green, rather above medium in size, and good producers of excellent fruit.

Gooseberry picking is where the problem grows serious. The thorns are superabundant, and very sharp. They have a habit of breaking off easily in the flesh. My boys have invented wire scrapers or hand rakes, with which the berries are taken off very rapidly, and with some degree of safety. Unless some such device can be used, gooseberry picking is so slow a task as to make a severe inroad on profits.

The market demand is at present much greater for green gooseberries than for ripe ones. This is fortunate, because the berries are much more easily removed from the bushes when green. In this state they are used for pies and puddings, and are canned for winter use. There is, however, a growing call for berries that are just short of being ripe — to be made into jam, or to be canned for later use. Jelly should be made of ripe berries, and is held by good housekeepers to be hardly surpassed by that made of currants or of plums.

The gooseberry has two serious fungus enemies. The English varieties are subject to mildew, and the American to leaf spot. The remedy I have in part suggested; that is proper planting on well-drained soil, reasonably open to sun and air. It is best to run the rows north and south, so that they can receive the full benefit of the sunshine. It is, however, necessary to treat both of the diseases named with fungicides. I always spray my gooseberries thoroughly with Bordeaux, just as the buds begin to start, and then again a couple of weeks later. The currant worm appears first on the gooseberry. As soon as they appear, and it will be on lower limbs, you must apply white hellebore with Paris green. It

NOTHING IS SO WELL PREPARED AS THE BLACKBERRY TO DEFEND ITSELF AGAINST THE COW'S TONGUE

NOTHING LIKE ENOUGH ATTENTION IS PAID TO PICKING FRUIT — (see page 301)

will not do to delay the application of this remedy, for the insects are astoundingly voracious. The bushes will be stripped of foliage within three or four days, and the crop ruined. This is not the worst of it, for the stripped bushes will be so devitalized that they will produce no fruit another year. Two or three years of undisturbed worms will destroy the plantation.

The propagation of the gooseberry is either by cuttings or division. If it be desired to multiply rapidly, use root cuttings, which grow easily. Cuttings are made precisely as with the currant. Cut off new wood, after it has become ripe, in October — cutting smooth beneath a joint; then insert in a well-prepared bed, from one-half to two-thirds length. Pound the dirt down tight, and leave the rows so that water will not settle about them during the winter. Layering is done by binding the branches down into furrows, on either side, and covering with soil. In the autumn the soil is removed, and the rooted branches cut away from the bush, for transplanting. Sometimes the bush itself is taken up and divided into smaller plants; only to repeat the process as fast as the small plants become large bushes.

Birds are especially fond of gooseberries, and some years they will make havoc with the crop. They do not select the sweeter and smaller sorts, but the large English varieties seem to them preferable. The oriole is the chief depredator; picking into the fruit, and extracting a small portion from a great many, without eating whole berries. Hens also, if allowed the range of a gooseberry garden, will pick the fruit as soon as it passes out of bloom — utterly destroying the crop. The simplest method of protection is a wire-netting fence, two feet high, surrounding the garden. Such a fence is very easily drawn out when needed, and rolled up for winter storage.

CHAPTER SEVEN

THE CRANBERRY

THE cranberry grows on a vine, which creeps close to the ground, and is liable to winter damage. Although it can be grown on high land as well as low, it has been found that cranberry culture, to be profitable, requires land that can be flooded during the winter. The trouble is often with late frosts in the spring, while bogs are sometimes ruined by summer fires. There are also insect and fungoid diseases that assail the crop. There must be sufficient water to entirely cover the bog from December until May, to a depth of one or two feet. The object of flooding is not only to protect the plants during winter, and against the heavy frosts of spring and fall, but to drown out insects, and guard against a drought. In some sections clean, coarse sand is spread over the entire field, to a depth of about four inches. The vines are planted in this sand. It affords a first-rate mulch to keep moisture in the muck below, while it keeps down weeds, and lessens labour.

There are many varieties of this excellent berry, but they can all be brought under three general types — the bell shaped, the cherry shaped, and the bugle shaped. I have frequently seen in cranberry sections at least a dozen very distinct varieties. Some of the more popular are the Howe, the McFarlin, and the Early Black. A low-bush cranberry is grown in Nova Scotia, and

shipped to the United States. It is highly prized in some markets, but I believe the bush is never under cultivation.

Cranberries are propagated by planting pieces of vines, cut about eight inches in length; two or three of these in a bunch; crowding the lower end sharply into the soil. The soil is raked on, or sometimes the vines are stepped on, and so pressed into place. They root readily, and rapidly cover the ground with growth. While flooding is done only for winter, irrigation is often practised during the summer. Especially during blossoming season the plants must not be allowed to get dry. Sometimes before harvesting, an early frost makes it necessary to flood the swamp temporarily. In this case the water must be let off again as soon as possible. The berries are gathered either by hand-picking or with what is called a scoop rake. These rakes are pulled very stoutly, but carefully; and it needs a skilful hand to manage them without tearing up the vines. It is not an easy fruit to land on the market in the best condition. Shipping is done generally in barrels, and the least carelessness will put the berries at a sharp discount in price.

The cranberry is rapidly becoming popular with all classes. A short crop is keenly felt by the poor as well as the rich. Beside the apple, no other winter fruit is so popular. It is wholesome, and even held up to be a cure for dyspepsia. The true idea of a rural home is to produce, as far as possible, all the fruits that can be used by the family — with more or less surplus for market. Not a few farms have an acre or more that could be easily turned to cranberry growing. While specially adapted to swampy soil, the berry can, on a small scale, be grown on high land, A small plantation may be successfully managed quite out of the cranberry sections. Mr. H. B. Tuttle advises that a good sand marsh may be made, near

any stream in a sandy region, by selecting a spot where water can be drawn from the stream; but he reminds us that water from a running stream is sometimes too cold for cranberries. The American Cranberry Growers' Association publishes annual reports; giving the latest information concerning this important industry. Its headquarters are at Trenton, New Jersey.

CHAPTER EIGHT

NEGLECTED BERRIES

BLUEBERRY — The term Whortleberry is commonly used as identical with huckleberry, bilberry, and blueberry. This berry is so exceedingly common, and prolific in forest openings, where there are many thousand acres given over to its growth, that it has not entered largely into cultivated gardens. In New England, New York, Pennsylvania, and Michigan large areas of forest are burned over annually to facilitate its growth.

The Maine Experiment Station has taken up the subject of blueberry culture, for the sake of systematic improvement of the fruit. It makes report of a section of forty thousand acres belonging to one owner. The land is divided into several parts, each of which is leased to some responsible party, whose business it is to assume the care of burning over the land, keeping off trespassers, harvesting and marketing the fruit. A section is burned over each year. This must be done early in the spring, before the ground becomes dry. If the fire is delayed too late it burns too deep, and the bushes are killed. Each section must be burnt over once in three years. In this way the growth of underbrush is checked, and the bushes are renewed.

On these blueberry farms the earlier varieties are picked by hand, and sent to the city markets in quart boxes. The later fruit

is sent to canneries. An implement called blueberry rake is used for the rapid gathering of the fruit.

Any one who has gone blueberrying, knows how very great is the variation in the character of the bushes, and in the size and quality of the fruit. At the Maine Station the belief is held that, by intelligent supervision, we can very greatly aid nature's efforts to create a better blueberry. The New York State Station is at work on the same problem, although its attention is directed more particularly to the high-bush huckleberry. A Massachusetts grower sums up his experiments by saying "(1) It, (the high-bush blueberry), does not take kindly to garden cultivation; (2) it is very difficult to propagate from the seed; (3) it is somewhat difficult to graft. But patience will overcome all of these difficulties." He adds that if we would cultivate the blueberry it must be on the north side of some shade; and the ground must be mulched with leaves or evergreen boughs. Another grower reports that he has been very successful in growing high-bush blueberries on a poor, rocky upland soil. "The bushes improve much in thrift, and yield from three to four times as much fruit as wild bushes, while the berries are nearly one-third larger." He sets his plants six feet apart each way, and mulches with strawy manure in the fall. These experiments indicate that this delicious berry is bound to enter into cultivation, and will be very greatly improved, in size of bush and of berry.

The high-bush blueberry grows naturally on any good soil, and the belief is very general that it can be greatly improved in size and quality. A. S. Fuller said "The huckleberry is one of those fruits which have been always neglected. Why, I am at a loss to understand, for it possesses naturally better qualities than the cur-

rant or gooseberry. All the Northern species are hardy, without thorns, and the berries will bear carriage to market better than the raspberry, blackberry, or strawberry. Thousands of bushels are annually gathered from the woods and fields; but these sources of supply will not always be available." It is reported in confirmation of this that the area where the wild plant grows is gradually growing smaller and smaller.

Barberry—Two strangely neglected fruits are the elderberry (sambucus), and the barberry. Nature thrusts them upon us in eloquent profusion; while we undertake to eradicate them, as for the most part pests. In parts of New England the roadsides give the barberry so freely, that the people seem to reject it simply because common; and in New York State the elderberry meets the same fate, for the same cause.

The barberries consist of low ornamental shrubs; some of them evergreen, and others deciduous. Vulgaris is one of the handsomest, hanging heavy with yellow flowers in May, and these followed by racemes of fruit, which become yellow in the fall and deep scarlet in the winter. This is a European variety, which has become thoroughly naturalized in our fields. A more common and less valuable sort is Canadensis. Professor Budd has introduced several new varieties from Russia, Siberia, and elsewhere. These are all hardy, but in no way superior to the European and American. Thunbergii is a low growing sort, from Japan, changing to a beautiful coppery red foliage in the fall. The Purpurea or purple-leaved barberry is remarkable for its deep violet purple foliage, and fruit of much the same hue, but small. A seedling has appeared on my lawns which gives both a florescence and fruitage much finer than any of the above. There are altogether about one

hundred species in America, scattered about from British Columbia to Patagonia. The deciduous sorts are all hardy; but the evergreen sorts are generally better adapted to the Southern States.

The barberries grow in almost any soil, from leaf mould to clay. They are rapidly propagated by the birds, which eat the seeds, but void some of them whole. They should be grown not only for the beauty of the shrub, but for the amount of bird food that they furnish. In this climate they are seldom devoured until spring, when the cedar birds take them, and during late storms the robins go to them for scant meals.

After all, the barberry, while furnishing a very good fruit for jelly, will take its place mainly among ornamental shrubs. Its position here is very unique. It becomes a brilliant, warm-looking scarlet bush, standing out of the snow in the middle of winter.

Buffalo Berry—This is known botanically as Sheperdia argentia, and is a native of the Missouri Valley, to the westward and to the southward. The berries are sometimes red when ripe, and sometimes yellow. It is generally grown only for ornamental hedges; but it is thought by good pomologists that the fruit can be greatly enlarged and improved. It is found necessary to grow it in groups, or in hedges, or slightly shaded, because isolated plants sunburn. The fruit is held to be by many superior to the currant for jelly and marmalade. It is admirably adapted to very dry climates, where the currant and gooseberry fail.

Cydonia—The variety of Cydonia which is generally known as Japan quince or japonica, bears a fruit which can be added to our list for making jellies. When properly grown and trimmed, the bushes return a very fair amount of fruit, from one to three inches in diameter. This is frequently used in drawers, among clothes,

for its very penetrating and delicious perfume. Used for this purpose it never rots, but shrivels until perfectly solid — still giving out its fragrance. If cooked like a quince, it makes a jelly hardly surpassed by any other fruit. I am not sure that we can be confident of a paying crop; but if we unite the glory of the flowers with the value of the fruit that we do get, we can afford the Cydonia japonica space in a very small garden. It can be grown as a hedge, alternating the scarlet, white, and rose-coloured varieties. I think the scarlet flowering has yielded for me the largest amount of fruit.

ELDERBERRY—The elderberry is truly a delicious fruit for tarts and pies; and the wonder is that it is so seldom gathered for household use. Horatio Seymour held the bush, in blossom, to be one of our most beautiful native shrubs. The flowers appear in June, in large flat cymes, and emit a very sweet odour. These flowers are followed rapidly by umbels of berries, which, when ripe, are jet black. These may be gathered, either for immediate use, or for canning. Our common elder is the Canadensis. The Nigra, or black-berried elder, is a native of Europe. It is in this species that we find the golden elder, the fern-leaved, the cut-leaved, and the pyramidalis. These varieties are very beautiful, but they belong on the shrubbery lawn, and not in the fruit garden.

For the fruit alone it will pay any one to grow, either in the garden, or in a neglected fence corner, a clump of elderberries. The fruit is yielded in very large quantities, on bushes that do not suffer from drought.

ELEAGNUS—This is a comparatively new berry-bearing bush, introduced from Japan. The bush itself is handsome, with its red branches and peculiar foliage. The fruit is very abundant, oval in shape, and very deep crimson when ripe. It is about half the size

of a Morello cherry — with a flavour both sweet and spicy. It is said to make an excellent jelly. With me it is not quite hardy, but endures our severest winters with some slight killing back. Most people are fond of the fruit.

JUNE BERRY—This is generally known as "service berry," and is being cultivated in private gardens. It is sometimes sold as high-bush huckleberry. Professor Card says that the alnifolia variety is large, sweet, and juicy — valuable for fruit and ornament. Budd says after several years' experience, he finds that, with proper pruning and cultivation, the size and quality of the fruit can be as much improved as those of currants and gooseberries. My own experience corresponds to his, that the uneven ripening of the fruit makes it impossible to pick it before the birds have gathered it. However, I should consider it a valuable fruit to grow purely for bird food; as it ripens in the strawberry and raspberry season. A hedge of it on one side of your garden, and a hedge of Tartarian honeysuckle on the other side, will keep the birds busy while you are picking your more valuable fruit.

SAND CHERRY—This fruit has been recently introduced, and has been tested all over the country — not altogether with satisfaction. The probability is that a very large number of poor seedlings have been sold. Budd thinks, from personal experience, that varieties can be selected which will be worthy of a place in any fruit garden. In my own grounds I have found the bush very fickle. It seems to be hardy, but will die very quickly, without apparent cause. It is subject to a fungus disease, which requires prompt applications of Bordeaux. I seldom get even a moderate crop. It grows to be two or three feet high, and the fruit is very nearly the size of the Morello cherry. It has been used with some success as a stock, on which to

grow dwarf cherry trees. There certainly seems to be something here very promising to work on; and horticulturists will do well to make a persistent effort to make the sand cherry show its inherent qualities at its best.

Viburnum — I am glad to be able to report the high-bush cranberry as receiving more and more attention. It is not a cranberry at all, but a Viburnum, and closely related to the common snowball. In good soil it grows fifteen to twenty feet high, inclining to send up several shoots from the bottom. The flowers are not showy, but the fruit becomes a brilliant yellow in August, and a deep crimson red in winter. It has served a grand purpose on my lawns as a bird food. The fruit is specially liked by the pine grosbeak — a glorious winter bird. The fruit is very seldom used for food by human beings; but it makes excellent jelly, and a sauce fully as good as that from the real cranberry. It can be multiplied very rapidly by cuttings, by layers, and from seed. The bush is entirely hardy all over the United States. There is but one difficulty with this viburnum, that it tends to become top-heavy, and then bend over with its weight of fruit, without power to become erect again after the fruit is removed. There are two remedies for this, either to grow in a tree form, with a single stem; or, if several stalks are allowed to grow, they can be held together, and at a proper angle from each other, with a stout wire. A hedge of this plant would be profitable for any fruit grower, not only for bird feed, but because its compact growing and height would render it a very good windbreak. It may be grown also in connection with larger trees that constitute a windbreak. Unlike the snowball, it is entirely free from insect depredation. I consider it invaluable for the pomologist who desires to encourage his bird friends.

PART THIRD

CULTURAL DIRECTIONS

CHAPTER ONE

WINDBREAKS; DRAINAGE; IRRIGATION

WINDBREAKS — If any one were to ask me what I believed to be the first essential to success in fruit farming I should say windbreaks. We have got to a time when this advice, always essential, is absolutely requisite to anything like mastery either in the orchard or garden. The true windbreak is a close row of evergreens, a very tall hedge, or a strip of forest. For summer use deciduous trees, such as basswood or beech serving the purpose very well. There is no longer any doubt about it, that the removal of forests has had a good deal to do with the increasing difficulties of fruit growing. The forest aids us in the orchard in two ways; first by breaking the severe sweep of winds, and second by conserving and balancing atmospheric moisture. It has been determined that fruit buds endure two or three degrees severer freezing, when the air is moist than when it is dry. If wind passes over a large body of water it becomes warmer, by taking heat from the water as well as moisture. We do not wish the wind to have free sweep and carry both the heat and moisture away from our fields.

So important is this matter of windbreaks, that I am satisfied every town should take measures for the establishment of protected forest belts; in some cases purchasing as public property belts that are liable to be cut. T. T. Lyon, the veteran

orchardist of Michigan, complained that in that State fruit growing had met with a very specific setback from the axe of the lumberman. He said, "We fruit growers have learned that forests in the rear have been a great protection against the influence of eastern and northeastern winds. Where the forests have been cut, we have found that we get a lower range of temperature, with an east wind in winter, than we did before. The damage done is however not measured so much by the degree of cold as by the combined cold and dryness of the atmosphere — both caused by the removal of windbreaks." There is at the same time to be noted, a marked change in the habits of birds, owing to the removal of their shelter and retreats. Professor Van Deman calls attention to the fact that our best apple sections are associated with the protected ranges of hills and trees. Where the beautiful and friendly forests are swept away, the sun beats down in summer, creating conditions favourable for sun-scald, scab, and blight; and the winds blow the apples from the trees in the fall. He enters a hearty plea for the public conservation of forest belts, and the planting of private windbreaks.

An ideal windbreak is a belt of trees considerably taller than the orchard itself. A single row of trees will serve the purpose very well, if no more room can be spared. Plant your windbreak as soon as you design your homestead. Easily grown and hardy trees for this purpose, are the Russian mulberry, the mountain ash, the wild cherries, and the lindens. These will serve not only to break the force of the wind, but will furnish a considerable amount of bird food and bee food. In the Southwest, farmers are growing wild plum trees for windbreaks; and in some cases the cultivated varieties. Where a considerable belt of land can be afforded,

nothing is better than catalpa. I have often recommended for windbreaks the Buffum pear — a variety that sends up its trunk as erect as a Lombardy poplar. If the trees are set in double rows, and about ten feet apart, the limbs will just about touch each other. The result will be a wall, almost as complete as a well-trimmed hedge. In blossom this pear is exceedingly beautiful; and the fruit, although not first class, is at least good, and especially good for pickling.

You will get some excellent hints from the way nature works up this principle of throwing up walls against the wind. I have seen in some of the Western States magnificent protective lines of oaks, chestnuts, and walnuts; and in the Eastern States of chestnuts, elms, and white ash. All along underneath these cluster elders, hazel bushes, and not a few barberries and hawthornes. Wild clematis, grapes, and Virginia creeper climb all over the trees, and hang down in curtains and festoons. I often wonder that a farmer can bring his heart to the destruction of these natural barricades, simply on account of their beauty. But what I now argue for is their retention as a matter of pomological economy.

If one cannot find a natural belt of this sort, already constructed, and must promptly substitute work of his own, he can do no better than begin with a row of evergreens — arbour vitæ, hemlock, or spruce. A general rule should be to plant that evergreen which is native to the section. Balsam fir is so brittle that I should make an exception, and refuse to plant it at all. The arbour vitæ is rapid growing, keeps its limbs well to the ground, endures trimming, and forms a perfect wall. The Norway spruce is a magnificent tree, and a good wall of this evergreen will break the force of the stoutest winds. The beautiful hemlock is more liable to breakage

than the arbour vitæ. If you have been in the White Mountains of New Hampshire, you know very well what the white pine can do. Pinus cembra is even more effective in Southern latitudes.

Orchard trees, sheltered by a windbreak, not only are preserved from the tearing force of winds in fruit-bearing times, but the trees grow in better form and more erect. I have seen orchards almost entirely stripped of their fruit during a half-day's wind-storm, while other orchards, not half a mile away, were barely thinned of their wormy stock. You will also be astonished to find how much the humidity of your land is increased by checking the force of the wind. Bear in mind, I argue all the time, that the belt of trees along your fence, or behind your orchard, is not to be simply tolerated; it is an absolute necessity. The windbreak is a part of good orcharding.

Bailey sums up the subject: "A windbreak protects from the cold; lessens evaporation from the soil and plants; lessens windfalls; decreases liability to mechanical injury of trees; facilitates labour; protects blossoms from severe winds; enables trees to grow more erect; lessens injury from the drying up of small fruits; retains sand in certain localities; hastens maturity of fruits; encourages the birds; and contributes to ornamentation." Where windbreaks and hedges are dense, and the orchard trees are planted close to them, there will arise more or less hiding of insects and breeding pests. There is also to be taken into account that some trees are ravenous eaters of the food which is needed by fruit trees. Windbreaks should not, therefore, be set too close to the orchard; and there should be an opportunity for working the soil over the roots, to destroy insects.

In California the trees most commonly planted are eucalyptus,

almond, walnut, apricot, fig, chestnut, Monterey pine, and Monterey cypress. In the Middle West, Lombardy poplar is still quite popular. I do not quite understand why, for its roots run a long distance, completely filling the soil, and devouring it to barrenness. The white ash is a very tough enduring tree, daring the roughest blasts; but it is another of the greedy exhausters of the soil. Trees of the thornless variety of Gleditsschia can be grown very closely together. The common locust and the osage orange I have found in common usage; both are excellent, except that the locust wood is brittle. All leguminous trees take nitrogen from the air, and do not rob the soil. For this reason they may be planted near our lawns and gardens, and will not impoverish the land. These leguminous trees include locusts, Kentucky coffee tree, and gleditsschia.

DRAINAGE — Careful drainage in orchard and garden is essential, because an excess of moisture dilutes the plant food, and prevents the growth of the plant, as completely as if there were no moisture at all. About fifty per cent of any ordinary soil is space, filled with either water or air. Coarse soils permit water to percolate more freely. This will facilitate the carrying downward of fertilizers from the surface, and will also make drainage more easy. During the growing season the soil is ready to impart its elements to the plants, provided it be not hindered by a surplus of water.

Some of the best orchard lands, being on slopes and foot-hills, will be sufficiently drained by nature; especially those which are underlaid with soils that allow a free passage of water. Where this natural drainage does not take place, artificial drainage must be supplemented. Surface drainage, carrying off the stagnant water

from heavy rains, is not generally the most important. The best supplementary method is tiling. This admits water at the joints; which are laid close enough to prevent the soil from entering, yet allow the entrance of water. The size of the tile must depend upon the amount of the water to be carried. It is certainly better to err on the side of too large tile; although the expense must be carefully estimated. In an ordinary orchard parallel lines, running midway between the rows of trees is generally most economical. Of course these tiles will almost invariably run up and down the slope, and be connected with either an open ditch, or larger tile at the foot of the orchard. The only thing we have to bear in mind is, that some soils will need tile every twenty feet, or forty, while in other soils the drains may be one hundred or even two hundred feet apart. The owner of land can easily determine this matter by putting in drains at one hundred feet or eighty; to be duplicated later, if necessary.

The depth at which a drain should be placed depends partly on the soil; but as a general rule three feet will be deep enough for the fruit garden, while four feet will be better for the orchard. I should say that for ordinary soil the use of four-inch tile, placed at three to four feet depth, would be the rule.

The profit of drainage will very soon cover the cost, and give an annual gain of fifty per cent. In fact we can do little or nothing with small fruits on undrained land. A practical fruit grower understands that he must have thoroughly healthy trees and plants, in order to produce marketable fruit. A tree standing in undrained soil is never a healthy tree. Bushes growing in undrained soil are liable to be loosened, if not thrown out during the winter. It is quite important that the tile should follow as far as possible on

straight lines. Every bend makes it probable that a stoppage of water-flow may be brought about gradually. If the tile are placed near roots, care must be taken that they lie close enough to prevent their clogging with small roots. The grade should be regular, so as to make the flow as even as possible in all the parts. If tile must be placed on soft bottom, it would be well to place underneath planks. If the difficulty is only for a short distance, flat stones will be better.

IRRIGATION — Land that is well drained is already well on the way to being land well irrigated. It is an error to suppose that drainage removes moisture, or dries the soil. It simply takes away that water which will sodden and sour the soil. Bailey sums up the subject admirably when he says, "Lands which enjoy perfect natural drainage are particularly desirable for orchards, because they are not only warm and give up their fertility easily, but because they also allow very early cultivation. If this perfect natural drainage does not exist, tile-drainage should be employed, until the soil is brought into the best possible condition. It should be said that many hard and wet soils make excellent pear and plum lands when thoroughly tile-drained. It is a common opinion that only flat lands need draining, but one often finds rolling lands in which the subsoil is high and hard, and holds the water like a dishpan. Judicious draining not only carries off the superfluous water, but it also loosens the subsoil, and allows it to retain its moisture better in times of drought." Proper draining does not dry the soil in dry times, but moistens it.

Until recently, irrigation has had very little meaning to Eastern cultivators. There has been an impression that a system of apply-

ing water to orchards and gardens, was essential in the arid sections, but that nothing of the kind was needed in the humid states. For the last few years sporadic and scattered attempts have been made to counteract the influence of droughts, more generally, throughout the whole country. We begin to feel that the loss of from one-fifth to one-fourth of our crops during a dry summer is no longer endurable. It is certainly wretched economy that does not make all possible prevision against the enormous waste of labour and crops, which we have suffered during recent years. The very general appearance of the windmill in New England and the Middle States is a hopeful sign.

Irrigation can be applied, in its perfection, in those sections of our country, where abundance of water can be found at from twenty to fifty feet under the surface. This condition exists very largely throughout the valley of the Mississippi, and those valleys which shed into the Mississippi. There irrigation has already become nearly as systematic as in the more arid regions. In some of these valleys the wells are dug like ordinary wells, until quicksand is reached; but through that a cylinder of sixteen inches or larger, and thickly perforated with fine holes, is driven down. Over these wells windmills are erected, costing from one hundred and fifty to two hundred dollars. The irrigation reservoir, which was at first made of plank, is now almost invariably made of earth. The bottoms and sides are lined with sod, after cattle and horses have been driven over the bottom, until the soil is packed very solid. On the comparatively level land, ditches can be carried from such a reservoir, without serious expense, to all parts of a small farm. Windmill irrigation is utterly transforming vast areas, allowing orchards and gardens to exist in their most luxuriant form. In

some cases the reservoirs have been made to serve a double purpose, by stocking them with German carp and other fish. Where the farmer has his own reservoir, he has also increased his food supply by adding the carp. In winter he also cuts a crop of ice; and in summer he has a swimming pond. Home is made richer and more interesting for the young people — for here are sports as well as profit. We are told that this irrigation method of gardening and orcharding produces mammoth crops of vegetables, while the fruit is larger and better coloured. One farmer reports that an acre of strawberry plants brought him ninety-two dollars net. The point, however, is here, that irrigation makes the crop a sure and certain one; while without irrigation drought may reduce it one-half, and greatly deduct from the value of the other half. Conditions favour a system, quite similiar to that described, in a large part of the Eastern States; and there are large areas where the water can be obtained from a depth of not to exceed thirty or forty feet. Unfailing rock wells are quite common at a depth of from seventy to one hundred and twenty feet. It will not pay to undertake irrigation with wells that can be exhausted in the most important season.

The semi-arid sections report marvellous results from irrigating their farms and fruit gardens. Frank G. Stephens, of Nebraska, gives such an admirable resumé of the whole subject, that I shall quote freely from his article in the *Western Fruit Grower*. He says that from a small beginning, in an experimental way, irrigation has expanded, until now there are two thousand five hundred miles of canals in the State of Nebraska alone — irrigating one million acres of land. "Fruit trees and small fruits are making homes homelike to-day, where once it was thought impossible to grow

them. Of such importance does the home-maker consider his orchard and fruit garden, that in many cases he furnishes irrigation for them, while he trusts his farm crops to Nature.

"One method is to irrigate from reservoirs, supplied by power plants, such as windmills or gasoline engines. Both are now manufactured with such cheapness and power as to be practicable, where water does not have to be lifted more than twenty-five or thirty feet. It has not been found best to irrigate directly from the windmill. Such a process requires almost continual attention, and the evaporation is excessive, while watering from so small a stream. Any farmer can scrape out a reservoir, holding from two thousand to five thousand barrels. This reservoir can be generally filled by the windmill at night; and a head of water be obtained of sufficient size and force to irrigate quickly and effectively. An orchard irrigated in this way during an exceptionally trying dust-storm held its fruit, but outlying trees lost nearly the whole."

Ditch irrigation is, of course, most extensively practised; but it is a good deal more expensive than reservoirs. The result has been exceedingly favourable in all forms of fruit growing. Eight thousand quarts of strawberries per acre is reported; and it is added that strawberry plants under irrigation do not need renewal as often as when left to ordinary culture. A two-acre raspberry field is reported as returning eight hundred dollars profit, per acre. Plum trees are especially advantaged.

Mechanical sub-irrigation has also received a good deal of attention; and the results are such as to encourage its farther application. Natural sub-irrigation is possible in those valleys where water rises under the valley lands, within three to six feet of the surface. Fruit growers are taking advantage of this provision of na-

ture, and occupying lands where the subsurface moisture furnishes abundant supply by upward seepage. In some sections it covers the whole fruiting season, and in others the season of small fruits. On such land orchards are long-lived and bear enormous crops. Where natural evaporation increases from thirty inches, in a given space, to sixty inches, the effect upon trees is to send them into an early and annual formation of fruit buds, while excessive growth of wood is checked. This early fruitage is fed from abundant water below, which ripens a full crop, at the same time that new buds are set for the next year.

In our Eastern States there are no crops that suffer more from drought than the strawberry and the raspberry. The roots of the strawberry are short, and they feed within a few inches of the surface; besides the strawberry itself is very largely made up of water — about ninety-five per cent. This is true of all our small fruits; but most of them reach deeper with their roots. One of the Experiment Stations reports that irrigated rows, as compared with non-irrigated, returned nine times as many strawberries. In my own garden it is a rare season when the last pickings of the raspberry are not small and comparatively worthless, from lack of sufficient moisture. It is not difficult to devise a system of troughs, that will carry water sufficient to supply a home strawberry bed or raspberry field through a pinch of a few days. However do not wait for the drought before making preparations. A Connecticut strawberry grower reports that by a home system he increased his yield over one hundred per cent. The Colorado Station advises irrigating strawberry beds every two weeks, and twice a week when in bearing. The Kansas Station tells us that they sometimes turn a hose into the furrows between the rows of plants; but when the

fruit is maturing they turn the water directly into the matted rows. If a showering is ever given, it must be continued until the ground is soaked several inches deep. Nothing injures plants and fruit worse than lightly sprinkling them — besides it never does any good, except to wash the plants. At the New Jersey Station, surface irrigation and sub-irrigation have both been tried, in comparison with non-irrigation. The early yield was largest on the sub-irrigated plat, and lowest on the surface-irrigated plat. The total yield, however, was twenty-eight per cent greater on the surface-irrigated than on the unirrigated plat; and it was thirteen per cent greater than the sub-irrigated plat. The Michigan Station recommends sub-irrigation, by using drain tile, placed just low enough to escape the plow. When irrigation is required, the lower end of the tile is closed, and the tile kept filled with water. A three-inch tile is considered most satisfactory.

Wilcox gives us the rule never to apply water in the orchard so long as the subsurface soil — say at a depth of six or eight inches — will ball in the hand. Water should not be expected to run in the furrows more than sixty rods as a rule. Any greater length of flow would cause the upper part of the furrow to become cold and check the growth of the vine or shrub; and in hot weather the water will evaporate too quickly. The same authority tells us that when apples do not come off easily in picking time, we will do well to postpone work, and thoroughly irrigate. "In twelve hours there will be a noticeable difference; in thirty-six hours the apples will gain in colour, plumpness, and size. When picking is resumed the apples will come off nicely, and be larger and more highly coloured. The gain may be at least ten per cent. This last irrigation affects cherries, plums, and grapes, as much or more than apples; and we

always irrigate, heavily, while they are ripening. The keeping qualities are also better. Prunes will make from forty to sixty, instead of one hundred and twenty to the pound, when liberally supplied with water. Unlike the apple, the peach should not be irrigated at the time of plucking, unless the trees are actually suffering for moisture, and this precaution applies particularly to fruit intended for shipment." He refers to one orchard where the peaches were of fine quality; but irrigation completely changed them within thirty-six hours. A slight touch would rub off the skin, while the previous delicate flavour was gone. In the case of the orange, irrigation should be followed by cultivation as soon as the soil will permit. It has been demonstrated that puffy oranges are due to uneven or insufficient irrigation. When nut trees are in full bearing, they must be irrigated while filling, or they will not yield well. But on no account must water be allowed to stand or to stagnate about the tree.

CHAPTER TWO

PRUNING; MULCHING; FERTILIZING; COVER CROPS

PRUNING — Nature desires in the first place to multiply trees, and in the second to multiply varieties. To accomplish this she has to protect her fruits, in the wild state, by methods quite different from those we adopt. The enemies to guard against are rodents, such as squirrels and mice; birds; and cattle. To do this she grows thorns, more or less, on her trees and bushes. The whole Rosacieæ family, with the exception of the strawberry, has this armour against browsing. In the second place she grows her fruit trees with close heads. A wild apple is a dense and almost solid mass of foliage. Suckers are encouraged at every point. The tree is never allowed to spread away, and open itself to the free examination of birds. In fact, nature creates a complete thicket to protect her apples. She prefers a great number of apples, small in size; so that in the wild state, or crab state, nearly every blossom produces fruit.

What we aim at, in growing fruit, is something very different. In the first place we fence out animals, and then we shoot or trap the rodents. In the place of a dozen small apples we prefer one large one. We shall not disagree with nature at all on one point; for we want the beautiful blossoms, and the sweet odour, just as freely

as they are produced in the wild state. But when it comes to the fruit, we are after quality in preference to quantity. We also prefer bright colour, and red apples. Nature has done very little in the wild state, in the way of colouration of most of her fruit. In order to accomplish our ends we begin at once to open the heads of trees, and cut out superfluous growth. The suckers take the life out of the big limbs, where alone we can secure large fruit. By selection, and other methods, we preserve those varieties which give us the prime essentials — bright colour, high flavour, and good size.

Pruning is the prime art of good fruit growing. Unskilled pruning, done at irregular times, is the cause of nearly all orchard failure. All about the country I observe fine young trees set, and, from the very outset, allowed by ignorance, or carelessness, to follow nature's method in the wild, without apparently any comprehension of the fact that good fruit cannot be secured along that road.

Pruning is not something that may be done, or not, as we please; nor is it a spasmodic and very irregular sawing of limbs from trees. It is the careful, precise, regular care of trees, from the moment the seedling rises above the ground, or the grafted tree is set. In fact proper pruning begins in the nursery, and if it is not attended to there the tree suffers from it through life. It is an art that moves on with the life of the tree, as regularly and systematically as cultivation. As soon as the young tree is received, cut it back sufficiently to remove all weak shoots, and shorten in the stronger ones. In general, balance the bud growth to the roots — so that there will not be twice as many buds started into growth as the roots can feed. The last bud on each of the preserved limbs should point in the direction you wish the

limb to take hereafter. This rule applies to all kinds of fruit trees. In planting berry bushes we have to cut them down close to the ground; our object being to secure the growth of strong new canes for the next year's crop. In order to do this we must not allow the mutilated roots to waste any strength on an effort to produce a few berries this year.

Your orchard trees will not have been set more than two or three weeks, before they will need very careful examination; in fact it is wise to keep them constantly under your eye. Buds will start around the crown, or almost anywhere on the trunk of the tree. These should be rubbed off at once, or neatly cut out. When I say cut out, I mean that the knife should cut so close as to remove dormant buds, that are always lying in wait around the base of a sucker. If you expect well-shaped and healthy trees, this business will have to be continued all summer. In some cases, it may be necessary to build up a new trunk, from the failure of the old trunk. This can be done, provided a bud starts above the graft. Be sure that no buds are allowed to send up shoots from below the graft. With plums and pears this building of new trunks can often be accomplished. When growth ceases in the fall, your new shoots will in most cases be very much benefited by cutting back from one-third to one-half — sometimes even more. Where the growth is very weak, you had better cut back to one or two buds.

You have now got your orchard started. Be sure that you do not allow it to develop as it will. It will surely revert to nature's method, unless you are constantly on the watch. Perhaps the cherry tree can be allowed as much freedom as ony one of our orchard trees. You have in the main only to open the limbs, and let in a plenty of sunshine. Some of the plums can be allowed a good deal of free-

dom; but the apples and pears must be kept continually under control. The same watchful care must be exercised against suckers, and as the tree develops, these must be removed from the limbs as well as the trunk. There should be a careful going over your orchard at least once a month — as I have described before, so as to nip out the incipient buds. At the close of your second year the heading-in should again take place. There are no absolute rules for this work, although such are sometimes laid down. The amount of wood removed should depend upon the vigour and strength of the shoots. Weak shoots and unripe wood should be more sharply cut away. Bear in mind that all this time you must be shaping the head of the tree; that is always leaving the terminal bud pointing in the direction the limb should grow hereafter. Do not hesitate to cut out enough shoots to prevent friction of limbs, and to keep the tree open to wind and sun. Keep the limbs headed as low as possible in order to shade the bark. Remember that nature creates leaves, not to shade us and the cattle only, but to shade the limbs and trunk of the tree. If foliage is so removed, or lifted so high that the trunk is exposed to intense sun rays, many varieties will prove unable to resist; and the consequence will be bark-splitting, sun-scald, and speedy decay. Insects will soon find these galled spots, and your orchard will go as your street trees are going by similar error.

The third, fourth, and fifth years of a tree are still very important. We must deal with them precisely as we deal with children; they must be taught at every step. If there is any neglect, even for six months, the effect will be serious, if not disastrous. The process for pruning will be along the same lines as during the first and second years. Keep out the suckers, remove superfluous shoots

as soon as they start, and head back in the fall. If a limb is broken, cut it out very smoothly; and if of any size, paint over the wound. Trees grown on this method will never require the sawing out of large limbs, when they are grown to fruitage — unless accidents intervene. The common idea of pruning is unfortunately something very different from what I have described. It consists in letting a man loose in the orchard, with a saw, and sometimes a hatchet, once in a year or in two or three years, to "trim the trees." The result is that large limbs are sawed away, and a general mutilation takes place. At nearly every stump of the limbs decay soon sets in. This tree-trimmer rarely condescends to remove suckers and clean the limbs. It is his business to do some trimming of importance. He has done nothing but mischief. This sort of work should never be permitted. Either keep your orchard trimmed, or keep out of business.

I quote a little compacted rule for pruning from the Stark Bros. that I consider cannot be improved. "Prune fall set trees early in the spring, before buds swell; prune spring set trees as soon as planted. Cut out entirely all weak, broken, or bruised limbs, keeping the head properly balanced; then shorten the remaining shoots to three or four buds at the base. Do not shorten cherry trees. When planting peach trees cut off all limbs, leaving a stick; and cut this back to eighteen or twenty-four inches from the ground. If you plant one year apples or pears, cut them down in the same way. Head a tree right when you plant it (low heads are the best) and heavy pruning will never be needed in the orchard."

A thoroughly kept up place needs incessant cutting and replanting. Every year will find more or less of decay; and every winter

will destroy something. When a tree has lost its vitality, or has become practically useless, spend no time on it, but cut or dig it, and put it on the bonfire. It will be advisable always to carry a notebook in your pocket, in which you keep a record of every little attention needed. Be conservative; never cut until you have thoroughly studied the situation, but cut decidedly when you find it advisable. I have occupied my present homestead for forty years; and have not failed of wood from decay and breakage, enough to supply a kitchen range for three or four months of the year. To keep pace with the progress of the age in pomology, you will be obliged to resort to more or less grafting. This requires trimming of a specific sort. A good deal of discretion must be used about removing suckers that start below grafts. They should not be allowed to come up thickly, and shade the new cions; neither should they be so abundant as to use up the strength of the limbs; we must, however, be careful not to prevent all of this pressure of the life into shoots; for if we do we may force our cions too rapidly.

When trees have come into full bearing, keep in mind that the apple and the pear produce their fruit on last year's growth only. In heading-in, be careful not to reduce the bearing wood too greatly. The peach, also, is borne altogether on last year's growth, and heading-in may serve somewhat the same effect as thinning the fruit. Japan plums may be treated in the same way as the peach, and for the same end; although some of its fruit is produced on spurs. The quince blossoms on new wood of the present year's growth; and our pruning of the old wood must not too severely cut away the last season's growth, out of which this years' fruit is produced. The grape also bears on fresh shoots, which also grow for the most part from the previous year's growth. Old wood

on the grape is of little value, unless you desire your vines to cover walls or arbours.

Fruit books some years ago were made up very largely of systems for shaping trees, according to the ideals conceived by their owners. Nature was not allowed to say much about it. Peach trees were to take a vase form; pears were trained to make nice pyramids; and cherries were grown espalier or pyramidal. All these notions are dropped. Our present aim is rather the opposite — to encourage the individuality of a tree, and let it express what we might call its sentiments and tastes. It is true not only that each variety of pear, apple, plum, or cherry has its bias, but each single tree will come to its best only by shaping itself quite freely after an inner impulse. Trees are not altogether unlike human beings. Our Japan plums are fine instances of tree individuality. We can open the head of a Wickson plum, but we cannot make of it a Green Gage in form, or a Shiro. A Burbank plum can be restrained from sprawling in every direction, but an irregular grower it still remains.

Our special objects in pruning are now reduced to fostering an equal flow of sap in all parts of the tree; to prevent a waste of vitality on superfluous shoots; and in general to stimulate but not over-stimulate fruit bearing. We must also remember that the lower branches of most trees must be longest; and this in order that, as the tree grows larger, the lower limbs may not fail in getting their share of sunlight.

Professor Card says: "The Eastern grower finds it necessary to thin his trees, and admit light and air to produce fruit of high colour and good flavour. The Western man, however, finds that under his conditions of intense sunlight and low humidity, fruit will develop colour regardless of such conditions. The Eastern grower,

if he neglects this, may find his fruit suffering from attacks of fungus diseases; but in general fungi are less troublesome in the dryer climate of the plains — so this reason loses its force in such localities." Professor Balmer insists that in the State of Washington, summer pruning, pinching, and even root pruning are required, west of the Cascade range; while east of the range, where the trees are inclined to premature bearing, and slower growth, winter pruning is advisable, to favour vigorous growth. In my Michigan orchard I find pruning of any kind, except the removal of suckers, much less needed than in my New York orchard. In the same orchard, if extensive, and covering a variety of soils, there will be much more danger of sun-scald in one part than in another. It is also never to be forgotten that some varieties need a good deal more protection from the sun than others. The Spitzenburg and Swaar apples are instances of varieties that must be allowed to shade their trunks as much as possible The Northern Spy, on the contrary, needs a great deal of opening, in order to colour its fruit and give it quality. Professor Card adds that in the Prairie States fruit will colour well in the interior of thick-topped trees; but in moist regions, especially where moss grows on the tree branches, the sun must be let in very freely.

Budd lays down the rule that light pruning is best when the leaves are about two-thirds grown; because at this time cell growth is active, and favours the rapid healing of the wounds. For cutting back wood very severely, he agrees that the dormant season is most favourable; or for severely cutting stunted trees, in order to secure more vigorous growth. Summer pruning, if severe, checks growth and tends to lower vitality. Root pruning is rather a subject for contention than for enlightenment.

MULCHING, is an indispensable part of good fruit farming. In some form it should be applied to every tree, bush, or shrub, that is transplanted. It should be applied as soon as the tree or plant is in the ground. The reason for this is plain enough. Moving a tree is a great strain on its vitality. The roots are disturbed, and new roots must be formed before living processes can go forward. If the surface of the ground, over the roots, is left to the influence of the sun, it will soon become baked, so that no moisture will be absorbed from the atmosphere. Success will largely depend upon preventing this. The rule is not much different from that described by Dr. Abercrombie for human beings; that is, "keep your head cool and your feet warm." We want to keep the feet of the tree warm and moist, at all events, and at all times. The feeding process must go on uninterrupted. Therefore we must not only mulch the tree when transplanted, but we must keep the tree mulched through its growth and bearing. Those who have used mulch have been surprised as well as pleased, to find how loose and pliable, as well as moist and warm, the soil is underneath. At the same time, excessively dry and hot weather does not considerably increase the temperature under the mulch.

If an orchard or fruit garden is to be plowed, the loose soil kept at the top by the cultivator, is in itself a mulch. Still it is better, where possible, to supply additional material. Where trees are planted in sward the mulch becomes all the more important. It has been found that such troubles as pear blight are checked, if not entirely prevented, by keeping a heavy mulch, always spread about the tree. In strawberry growing, mulching is an absolute requisite to success. As soon as the cultivator has finished its work, and picking time approaches, spread be-

tween the rows sawdust, or cut straw, or some good fertilizing compost.

The most common material at our command for mulch consists of barnyard manures, thoroughly composted with coal ashes, until decomposition has blended the materials. Coal ashes alone (from anthracite coal) is a superb mulch for almost all of our trees and plants. Spread about apple trees and pear trees, the effect is very marked. It is a good material in the berry garden, spread freely between the rows. It loosens clay soil, and keeps it in a condition for freely absorbing the nitrogen of the air. Tan bark may be used, and is an excellent material in raspberry fields. Our compost piles should include a very large proportion of autumn leaves, to add humus to the soil.

While it is true that a thick mulch softens the bark around the crown of roots, it is also true that coal ashes will prove to be exceedingly useful, and a preventative, against borers. They may be piled around the tree two or three inches up the trunk; but if rotting material is used, let it be kept back an inch or two from the body of the tree. To the ordinary planter all this work may seem to be superfluous; or at least more than he is willing to undertake. In reality it is not so serious from the standpoint of labour. Let it be an established custom, to spread the furnace and range ashes about trees, and in the berry garden; rather than dump them in the highway, or make of them unsightly heaps. Bear in mind also that a liberal mulch will save a vast amount of watering, during dry spells. You simply cannot have good fruit by merely planting trees. You must take care of the trees, and do it thoroughly. You cannot afford the cost of the trees, unless you can afford also the proper care of them.

MANURES — As a rule barnyard manure is the best for all sorts of crops, including fruit and fruit trees. Yet there is nothing more dangerous to use about the roots of trees than undecomposed barnyard manure. Barnyard manure may be safely used broadcast, or in composts. It does not contain all the constituents of plant food; nor must it be understood that the manure of different animals is similar in quality. Cow manure contains very little solid matter in proportion, and is poorer in fertilizing material. Horse manure ferments quickly, and is a good heater. Poultry manure contains nitrogen, in the form of uric acid. The manure from fattening animals will contain over ninety per cent of the fertilizing constituents of the original food. But as taken from the ordinary barnyard, these manures are very far from making a complete fertilizer.

Composting is a matter that should be well understood not only for the improved value of the manure, but to prevent the excessive waste that takes place from the ordinary distribution of manure. Prof. S. W. Johnson suggests that every farmer should have a water-tight trench, four inches deep and twenty inches wide, constructed in the stable floor, immediately in the rear of the animals, and every morning put a bushel of muck behind each one. "When the muck and dung are removed from the stable, they should be well intermixed, and as fast as the compost is prepared, it should be put into a compact heap, and covered with a layer of muck several inches thick." Professor Semple recommends a layer of peat, two feet in thickness, and over this a similar layer of farmyard manure; until the layers are four or five feet in height. Professor Stores suggests that we do not use so much peat or other admixture as to wholly prevent the dung from fermenting. What this

ferment is we do not yet understand. We only know that it is due to bacteria.

I have for some years past used no other manures than those which have been prepared in compost piles. I cannot say that my work is absolutely scientific, but I am saving that enormous proportion of waste which occurs from the spreading of unfermented manures. My custom is to gather all waste vegetable material about my land, and there is always more of this than one would suspect — in the form of weeds, turf, and leaves. To this I add all the barnyard manure, placing it in layers with other material. Coal ashes, including a small per cent of wood ashes, are added, in as large proportion as I can obtain, and a very large amount of autumn leaves. One of these compost piles is so situated that household drainage passes into it, and is absorbed. These piles are comminuted late in autumn, and applied to orchard and garden. Professor Johnson suggests, as a good formula, one hundred bushels of muck of similar material; unleached wood ashes, twelve bushels; gas lime or marl, twenty bushels; adding ten bushels of quicklime — slaked with water or salt brine. Professor Fleming offers the following formula: "Sawdust or peat, or similar material, forty bushels; coal tar, twenty gallons; bone dust, seven bushels; sulfate of soda, one hundred pounds; sulfate of magnesia one hundred and fifty pounds; common salt, one hundred and fifty pounds; quicklime, twenty bushels." The following is a formula for what is called the lime and salt mixture: peat or muck, fifty cords; caustic lime, one hundred bushels; common salt, seventeen bushels. Such compost piles may generally be raised about four or five feet high. If made late in the summer, they will not be ready to spread until the following spring. In such piles you will

find that fresh trimmings from trees and grape vines will decompose, and will add decidedly to the plant food.

Formulæ for fruit trees have been suggested by different Experiment Stations. The New Jersey Station recommends for peach trees, "Nitrate of soda, one hundred and fifty pounds; superphosphate, three hundred and fifty pounds; muriate of potash, one hundred and fifty pounds." For strawberries is recommended "Dissolved bone meal, two hundred pounds; unleached wood ashes, one hundred and thirty pounds." Mr. J. H. Hale of Connecticut, recommends for all small fruit, "Wood ashes, two hundred bushels; fine ground bone, three thousand pounds."

Nitrogenous elements are added to the soil by cover crops, very largely; but phosphoric acid and potash are the constituents likely to be needed in orchard and fruit gardens. The formulæ suggested above are based on this supposition. Lime is not a direct manure, and yet is absolutely indispensable to plant growth. Its most important use is to correct the acidity of a soil. It also performs the function of liberating plant food already in the soil. The Ohio Experiment Station reports, "If a little lime be mixed with strong manure, such as hen manure, an odour of ammonia at once indicates that the lime is letting loose the ammonia of the manure." Lime will increase crops, but at the expense of soil stores of plant food. European farmers have a proverb that "Lime enriches the father, but impoverishes the son." There should be added to an orchard every four or five years, from seven ounces to twenty-five ounces, per square yard, of burnt lime.

Potash is consumed in all parts of your trees; in the production of sound wood, and healthy leaves, and rich fruit. Nitrogen is used by the tree to develop the mass yield. Phosphoric acid is es-

sential to both the quality and yield. Phosphate of lime furnishes both the phosphate and a considerable lime. A European formula gives us as the proper fertilizer for orchards, per acre, "One hundred to one hundred and seventy pounds of forty per cent potash manure salts; one hundred and seventy to two hundred and forty pounds of phosphate of lime; forty to sixty pounds nitrate of soda." It must never be overlooked that different soils are deficient in different ingredients. The fruit grower must learn to experiment and observe. He must test his soils, until he has found out what is needed. Although cultivating less than ten acres of fruit, I find in different parts of my grounds very different needs. After using a general compost, there still remains the necessity of applying special fertilizers in different parts.

Where market gardening is carried on extensively, barnyard manure is invariably used in connection with commercial fertilizers. It assists the action of the fertilizers, and makes them more effective. In Germany the greatest yields of root crops are obtained "only when barnyard manure and commercial fertilizers are used together." Those making the tests express the belief that this is due to a mechanical effect of the barnyard manure on the soil. Another surprising result is that, even though a heavy application of nitrate of soda be made, the plants take up less nitrogen than when barnyard manure is used with it; and a dressing of barnyard manure gives heavier crops than when nitrogen, phosphoric acid, and potash are applied in their commercial forms. It is still farther demonstrated that "a measure of nitrogen taken from barnyard manure, produces more substance than the same quantity taken from a commercial fertilizer. Manure taken from the yard is found less valuable than manure that has not been exposed to the

weather." Soils well supplied with nitrogen and humus do not need, and are not so greatly benefited by barnyard manure.

Bailey lays down the rule that any land which is fit for the growing of crops will maintain a fruit plantation without additional plant food; and enable the trees to produce a normal quantity and quality of fruit. The fruit grower, however, is after the superior quality and the extra normal quantity; and these demand the best cultivation, and plenty of tree food. He suggests that if the fruit grower applies five tons of fertilizer to every acre of orchard and fruit garden, and takes it back in the way of profit, the quantity is none too large. However, the ignorant application of manures, and especially costly fertilizers, is likely to bring about nothing but financial loss. The orchardist should in the first place know the makeup of his soil. If it is well supplied with humus, he does not need to add more; but if not, he must work along the line of stable manure, muck, and cover crops. When the land owner discovers what his land needs, he must also undertake to find out what values there are hidden in his soil. As a rule cultivation has been of a character to use up specific elements, and leave others. Ordinarily orchards, like wheat and corn fields, lose their humus sooner than their mineral plant food; and an exhausted soil means that it has been put in such a condition by cultivation, that it cannot show its strength, nor contribute its elements as plant food.

The use of commercial fertilizers has become so common, and the application produces such quick results, as to lead to some serious mistakes. What we need in the orchard and fruit garden is that which will assist nature, without stimulating artificial growth. We cannot quite say that the slower a tree grows the better; but we do not wish very rapid growth, even in the apple orchard. If

we are to secure steady, strong and well-ripened growth we must not use quick-acting fertilizers, but slowly decomposing manures from the barnyard and the factory. Professor Voorhees recommends for fruit trees, "One part muriate of potash, with one and a half parts ground bone." He would apply this with clover or cowpeas; and then turn under.

For small fruits in the garden, more rapid growth may be required; and quick-acting fertilizers may be applied. On heavy soils phosphates are likely to be of more benefit than nitrogen; and the reverse on light soils. Clay soils as a rule hold more potash than sandy soils. Undrained soils are never in the condition to make the best use of any sort of fertilizers.

Professor Roberts, of Cornell Experiment Station, estimates, by careful analyses, that the value of nitrogen, phosphoric acid and potash used up by an acre of apple trees, in twenty years, in fruit, is one hundred and forty-seven dollars; in foliage, one hundred and sixty dollars; in wood, seventy dollars. He says that many old orchards not only make these large demands on the soil, but in most cases the land is also compelled to furnish hay or grain; or to fatten lambs and pigs. By another table he shows that five bushels of apples remove about eleven pounds of nitrogen, nearly one pound of phosphoric acid, and sixteen pounds of potash; and that the leaves of a tree large enough to produce the apples would contain ten pounds of nitrogen, nearly three pounds of phosphoric acid, and ten pounds of potash. No one would think of trying to raise wheat, even on the best land for twenty consecutive years, without the use of fertilizers.

Voorhees suggests "To provide vegetable matter and improve the physical quality of soils, apply yard manure once in four years,

at the rate of from five to ten tons per acre. To aid in the decomposition of vegetable matter, and insure lime as plant food, apply lime at the rate of twenty-five bushels per acre once in five years. To provide in addition, available plant food for tree and fruit, apply annually one hundred pounds nitrate of soda; one hundred pounds South Carolina rock superphosphate; two hundred pounds of ground bone; and two hundred pounds muriate of potash."

In the orchard it is specially important that pomologists do not overlook the need of humus. When this is absent, light soils become lighter, and clay soils become lumpy. Commercial fertilizers will not fill the bill; the final and only remedy is cover crops.

COVER CROPS — In the orchard we have had to revolutionize our earlier methods of culture. We found that apple trees, which used to grow two feet in diameter, remain in health, and bear heavy crops of fruit for more than one hundred years, would grow only half as large, and decay in half the time. Then began a more scientific study of the orchard. It was evident that the trees were lacking in that sort of plant food which they required—a large amount having been used up by a hundred years of cultivation. The trees were growing smaller because they were starved. How to apply food was the question. Should our orchards be kept under cultivation? Many of the best growers advocated growing in the sod, with annual mulches and commercial fertilizers forked in. In order to plow an orchard the limbs must be lifted higher than for some reasons we like to grow them. Some of our very best varieties, if grown high on their own wood, sun-scald and winter-kill. Much logic was wasted to show that varieties have a life-period, just like individuals. It was answered, "But the supposed death of a variety is not universal, for

in some places the Spitzenburg is still very thrifty." Then some one began to notice that our old Spitzenburg trees were grafted eight or ten feet high on seedlings; but our modern Spitzenburg from the nurseries, were grafted at the roots. The former were very hardy, and the latter subject to winter-killing. The very sensible course was to go back to high grafting. This has been done, and behold the fine old apples are as hardy and prolific as ever. It has been finally determined that no one can prove that a variety runs out; but that some apples and some pears are so sensitive to the sun, that they must not be grafted at the roots, and grown on their own stock. This problem having been solved, we were a little nearer a solution of the question what to do with our orchards in the way of cultivation. We really can lift the limbs of orchard trees high enough to plow under them, provided we have grafted tender varieties on hardy stock.

About the time this problem was being settled there was a remarkable discovery as to the nature of clovers and leguminous plants; including their power to take nitrogen from the air and add it to the soil. We found ourselves in possession of certain forage plants that might be grown for an indefinite number of years on the same soil, and yet leave that soil richer in nitrogenous food than it was originally. Experimenting has led us finally to the following plan. Plant your orchard with peas or early potatoes, and when these are removed sow with cowpeas or crimson clover, in the South; in the North, with red clover or alfalfa. These are to be left on the ground all winter as a protection to the roots of the trees. Plowed under in the spring, they add humus — that is incipient soil, to feed the trees. Once more cultivate until August, and then sow again for another winter's covering. These are called cover crops, and serve as a warm blanket for the winter.

There are other cover crops that are used where the soil is naturally heavy and hard; such as rye, oats, millet, and buckwheat. Of these, buckwheat is one of the best — sown not for grain, but to be plowed under in the spring. Crimson clover and cowpeas are available, not only in the Southern States, but as far north as Pennsylvania and Ohio; while some varieties of cowpeas are hardy enough to be sown in Central New York and New England. Each one must study his own orchard, and determine its specific needs. If trees grow too slowly, use nitrogenous cover crops; if not, use buckwheat, rye, and millet.

For purposes of cover, non-leguminous crops may be just as good as the nitrogen collectors; and when fruit plants are growing rapidly they may be even better, because they do not stimulate overgrowth. It is quite possible to put too much nitrogen into the land, and compel the trees and plants to make unripened wood late in the season. Bailey considers that the golden scale of cover crops for orchards begins with rye, and ends with crimson clover. Lands which are sandy and leachy, especially in the Northern States, are not adapted to crimson clover; but must be gradually prepared for it by other plants — rye as a rule. Indian corn sowed very thickly, six weeks before killing frosts, makes a good land cover, although it does not live through the winter. The use of vetch as a cover plant is also strongly recommended from the Cornell Station. Young trees of pear, plum, and apricot make an excellent growth among the vetch. The latter makes a remarkable cover, growing knee-high in a dense mat, and everywhere completely covering the ground. In the spring the decayed vines can be easily plowed under.

CHAPTER THREE

SPRAYING

SOME of us remember painfully the fight we undertook to carry on, forty or fifty years ago, against the increasing invasions of insects and mildews. In those days we called nearly all fungoid diseases under the general name of mildew; while the insects were known generally as bugs and lice. The curculio took our plums, the slug defoliated our roses, the codlin moth made our apples unsalable, the currant worm utterly ruined our gardens, and finally the potato bug marched in from the West, meeting the cabbage worm from the East, and threatened to drive us off our farms altogether. We owe it largely to the genius of C. V. Riley, ably seconded by William Saunders and Prof. A. J. Cook that we learned how to meet our invading rivals, and rescue our orchard and garden crops from absolute destruction. Paris green and London purple were introduced by these pioneer experimenters, soon after 1870. Progress in the materials to be used, and apparatus for effectively applying them has gone steadily forward. We have now in hand fungicides and insecticides and spraying machinery, which make it unnecessary for an intelligent fruit grower to lose any large percentage of trees or fruits. It is true that new problems constantly arise, because new invasions constantly occur. The gipsy moth and the San José scale, two of our worst competitors to-day, we

knew nothing about forty years ago. Still human genius and enterprise, combined, have been able to keep pace with all nature's tests and trials, and we are coming out ahead in the only struggle that has ever seemed to be a hopeless one for human beings.

No possible rules can exactly furnish directions for the application of fungicides and insecticides. There is always a demand for a certain amount of intelligent study, and adaptation to conditions. To supplement individual effort we have now the magnificently organized Bureau of Plant Industry, in the Agricultural Department at Washington, while most of our State Experiment Stations are doing superb work. Bulletins from these sources are sent without charge, to orchard growers. All these organizations of energy are barely able to keep apace with the changing demands made upon us by the countless tribes that enter into competition with us, and a struggle with each other for existence. When we have, as we suppose, a perfect prescription, we still find that our rules do not work; and the demand is always more brains. For instance, in 1902, the excess of moisture from continuous rains, upset all our supposed absolute rules for the application of arsenites and copper mixtures. The lime in the mixture was taken up by the atmosphere, and all over the country behold we had burned our trees — doing as much harm, or more, than we had prevented.

I think we may safely say that we have more to dread at present from fungoid foes than from insect enemies. For this reason we have learned to begin the year's battle, sometime before the foliage appears, with a very thorough application of Bordeaux mixture. Spraying to control fungus diseases is a preventive measure in all cases; and in very slight degree can be classed as curative. If we wait until the blight or anthracnose has manifested

itself, we may check somewhat its spread, but we cannot cure the mischief that has already been done. It becomes necessary, therefore, to apply a fungicide before we are sure that the disease will appear.

Remember that a fungicide must be applied very thoroughly. The minute spores of the diseases are lodged, we cannot tell just where; and we must so thoroughly apply the spray that no part of the tree or vine is untouched. Bear in mind, also, that the effect of all spray is cumulative ; and this is specially true in the application of fungicides. Many of our plants form their fruit buds the previous season. An apple tree has its buds all tucked away so snugly, that it is very improbable that we shall be able to get at all the germs with one spraying. The early spray is most effective. Spray before the buds open. This first application must be followed by another within two weeks; and successively throughout the season. Each application adds its preventive force to the preceding.

The leading evils that are just now causing the most anxiety and labour are crown gall, tripeta fly, San José scale, different forms of aphis, peach yellows, apple scab, pear psylla; while the codlin moth remains quite as persistent an enemy as ever. The curculio, which has done its vicious work for seventy-five years, without let up, is giving us less trouble. The currant worm we know very well how to check; while the caterpillars have been recently kept in subjection, partly by the development of parasites. Apple scab is always present in our orchards, and, if left to itself, will be as destructive as ever. We have learned, however, that it can be controlled by successive applications of Bordeaux.

Crown gall is on the increase, both in berry gardens and orchards. The so-called galls are irregular growths of tissue, that

form around the tree, just below the surface of the ground; or on the roots. In the case of berries you will find them developed very freely on the roots and rootlets. This disease was not noticed in any aggravated form until 1892, when the California Station published a Bulletin on the subject. About 1900 the gall was developing so rapidly on almond, peach, and apricot trees, in the form of a slime mould, that several of our Western Stations began an investigation. Professor Toumey, of the Arizona Station, wrote that the presence of crown gall was already bringing about an enormous annual loss in all parts of the country. "The mischief begins underground, and it may be brought from a nursery, and inoculated into your soil, without very careful oversight." He said: "The total annual loss from this disease in this country, in all probability already reaches the enormous sum of from $500,000 to $1,000,000 — possibly much more." The gall is found on blackberries and raspberries very commonly, and is the cause of the dying out of plantations — where the owner finds himself puzzled to account for it. In my own garden the gall is rapidly eradicating my Cuthbert raspberries and Golden Queens. It has not attacked the black raspberries, and such hybrids as Schaffer. Our chief danger is that the gall can be transferred from one species to another. We do not yet know, however, that it can be grafted from berries to orchard trees. Nurserymen know so little about this terrible evil, that they are not inspecting their plants for its extinction. The best remedy for crown gall is, of course, not to buy doubtful stock. At the Arizona Station the galls are cut away from trees, and the wounds are covered with a paste, made after this formula: copper sulphate two parts; iron sulphate one part; and unslacked lime three parts. These ingredients are reduced to a fine powder,

and thoroughly mixed; after which water enough is added to make a thick paste. All diseased wood should be collected and burned; for it has been proven that the germs in the galls may remain alive for a long while. I have given this comparatively new pest prominence, because I am satisfied that we are going to have a good deal to do with it. The galls kill the plants by interfering with the transfer of sap. If they are formed around the crown of a tree they will cause the death of the tap root, and so devitalize the tree as to make it worthless. The Maryland Station reports that it is particularly destructive to peach trees. The infectious character of the gall is strongly emphasized. After a plantation of berries has been destroyed, the ground should be cultivated for several years before it is replanted for fruit. The disease has been so thoroughly spread over the country, that it will be very difficult to either eradicate it or control it.

The tripeta fly is another comparatively new trouble, and has some specially annoying features. The work is done by a fly, and not by a moth. Moths, as a rule, work for a short period of time; but this fly works all summer. The egg is laid just under the skin of fruit, in all stages of its growth. The larvæ is liable to hatch out at any time, even after the fruit is stored in the cellar. It gutters the inside, so that the pulp is a mass of blackening decay, while the skin is that of a sound apple. The favourite working place of the fly is in the shade; and, so far, we have no preventive, or remedy, except to keep our orchards open to the sun and the wind. Unfortunately this rule will not work in small gardens, where we desire to combine plums and cherries with berry growing. However, if we bear in mind the fact that the fly does not like the sun, we shall be able to considerably check its ravages. Like all fruit lovers,

this fly has its decided preference for sweet apples and those of mild flavour. Pick up every dropped apple or pear (although it seldom attacks the pear), and either feed them out to animals or grind into cider.

The San José scale has, in spite of all efforts to the contrary, found lodgment in nearly or quite every State in the Union. It is very minute, and easily distinguished from the larger scales which frequently infest our trees. It has proved to be one of the two or three most destructive enemies that ever invaded our orchards. It does not confine its work to orchard trees, but readily passes over to shrubs and lawn trees. If left to work its own will, it will turn the most beautiful land into a desert. The best remedy is the lime sulphur, and salt wash, prepared as follows: Fifty pounds of unslaked lime; fifty pounds flour of sulphur, twenty-five pounds of common salt. Slake the lime in enough water to do it thoroughly; add the sulphur, and boil the mixture for one hour. Add water if necessary, and then add the salt. Boil again for fifteen minutes; after which add water enough to make one hundred and fifty gallons. Spray with a coarse nozzle, any time before the buds swell. The solution should be used at a temperature of at least one hundred degrees. The utility of this wash depends largely upon the strength of the sulphur. Use a Baume's scale for acid, and if it shows eight degrees when cold it is all right. Dip a knife-blade into the solution, and if it discolours the blade it is too strong, and water should be added. The writer of the above prescription, A. C. Porter, of Hood River, Oregon, adds that he has seen San José scale destroyed with one application. I observe, however, that in the tests made in Maryland and Connecticut, it has been necessary to repeat the application two or three times. It may be well to re-

member that this spray is equally useful in destroying scale insects of all sorts; the pear leaf blister mite, aphidæ, twig borer, bud moth, and clover mites. Mr. Porter tells me that some orchardists substitute for salt, one and a half pounds of sulphate of copper, in fifty gallons of water. I believe this gives the best remedy, in the most approved form. The application of crude petroleum is a remedy which can do so much mischief, when carelessly applied, that I shall not discuss it. Nursery stock is frequently placed under tents, and subjected to fumes of hydrocyanic gas. This is terribly dangerous work, and, although effective, cannot be recommended for those who are inexperienced.

Different forms of aphis have been a pest from times immemorial. I confess that I have had more trouble with these insignificant multitudes than with any other enemy. If allowed to get established on a bush, or tree, the leaves curl up, and it is with great difficulty that they can be hit with spray. The best rule is to begin very early, and spray very thoroughly, as a preventative — before you have seen any. In some parts of the country, where hop fields are adjacent, our worst enemy is the hop louse. This species appears in vast multitudes on our plum trees and buckthorns, where it propagates through several generations, and later migrates to the hop fields. Some years we find our currant bushes completely covered with aphidæ; while at other times the greatest mischief is done to our sweet cherries. Apply Paris green as soon as the first insects appear; and repeat it every two or three days. Kerosene emulsion is a good remedy, but must be applied early and often. But when you are through with these, and similar applications, you will probably find that the only sure cure is the use of the lime, salt and sulphur mixture.

The apple aphis has recently given so much trouble that I cannot pass it by without specific attention. In 1902 it appeared in great numbers in New York orchards. In Idaho the Experiment Station made a special study of the insect, and methods of combatting it. The eggs are deposited in October and November, on young shoots of apple trees, usually near the tip. These eggs hatch about the last of April, as the young leaves are unfolding. While the weather remains cold the lice do not make much show, and you are likely to first discover their presence from the curling of leaves. They multiply very rapidly. After increasing and spreading through the summer, a generation of perfect males and females is produced in the fall; and the females lay their eggs, as described, for the next season. They have a host of natural enemies, including birds, hornets, etc. The damage to the trees is caused by their sucking the sap from the tender shoots and leaves. The Idaho Station recommends destroying eggs in the winter. The chief remedy, and the one most strongly recommended, is one pound of lime, one pound of sulphur, and four gallons of water. Slake the lime; then add the sulphur, and enough water so that the mixture will stir easily. Put it over a fire, and stir until the boiling begins; it should be boiled one hour or more. The mixture should be completely dissolved, and of an amber colour. Now add water enough, with what was already supplied, to make four gallons. Strain as you put it into your spraying tank. A very common remedy is kerosene emulsion; and a still better one a mixture of quassia chips and whale oil soap in solution. This solution is made by taking eighteen pounds of quassia chips to ten gallons of boiling water. Let them stand for ten or twelve hours, then pour off the water. Heat this solution to boiling, and add to it eighteen pounds

of whale oil soap. Dilute this to make one hundred and eighty gallons for spraying.

Peach yellows has done a vast amount of damage, sometimes sweeping away whole orchards. But intelligent growers are now sustaining a sharp quarantine against it so that the trouble is greatly decreased. Like some other fungoid diseases, and insect pests, it seems to run its course, and then make less trouble. It is a very peculiar disease, and is pronounced, so far, incurable. The means of communication are unknown; but it is certain that it does not spread through the soil. The unmistakable symptom is the red-spotted character of the fruit. The second characteristic is tip-growth late in the season; and the third mark is yellowish shoots, pushed out from the body of the tree, or on large limbs. Diseased trees die within four or five years. The Department of Agriculture says that a new orchard may be planted in the place of an old one, and not be contaminated. The only remedy is prevention, and extermination.

Apple scab is always present in some degree in our orchards. In 1902 there was a very general outbreak of the disease. The remedy is Bordeaux mixture, applied very early, and continuously. It has been found that the frequent use of Bordeaux during the summer discolours fruit, but the Idaho Experiment Station reports that this can be prevented by using a larger proportion of lime. When four pounds of lime were used to four pounds of copper sulphate, no russeting resulted. We must, therefore, slightly modify our standard recipe for Bordeaux.

The pear psylla is not a new pest, but until recently it has been confined to a few localities. In 1903 it appeared over almost the whole of New York and several adjacent states. This insect

attacks the growing part, and in a short time completely covers the tree. The foliage turns dark brown, and is covered with a secretion, commonly called honey-dew. Bees make a large amount of honey from this substance, while the white-faced hornet destroys multitudes of the insects. The pest is liable to disappear as suddenly as it comes. It breeds a large number of parasitic enemies. Spray with kerosene emulsion; or with whale oil soap solution.

I have said enough concerning the codlin moth in connection with apples and pears, to make it unnecessary to go into any extensive discussion of it in this chapter. The insect is spread largely by shipment of infested fruits. These fruits, with the inclosed larvæ, may be sent across the Atlantic, and may develop after their journey is over. Crawling out of the fruit, they spin cocoons; and when the moths emerge they fly to the nearest orchard and deposit their eggs. These pass the winter in the larval state, but are ready for very prompt work in the spring. It has recently been discovered that the leaves are considerably eaten before the fruit is entered. The larvæ find difficulty in entering the smooth sides of the fruit, but this is sometimes done. Eighty per cent enter by the calyx; but the second generation takes advantage of the contact of two apples, to bore through the adjacent sides. The larva lives about twenty days in the fruit, then tunnels out, and immediately seeks a place to spin a cocoon. These cocoons may be found under rough bark, and in holes, and cracks of the tree. The means of control are partially preventive. Thorough tillage of the soil, and the sowing of cover crops annually, is very beneficial. Keep the head of the tree open to the sunshine and the wind. Keep the tree bark smooth, and prevent holes being occupied by the larvæ. After this your work consists in spraying with arsenites; beginning

just before the buds expand; repeating the application three or four times, if possible, at intervals of ten days. One rule only must be remembered, that the arsenical spray should not be applied when the apple blossoms are just expanding, and before the petals drop. If a thorough application is made just at this time, we have two injurious results — it will kill a very large part of the fruit, and a good many of the bees feeding on the blossoms.

Spraying is often a comparative failure from the condition of our neighbour's orchards. If we have a near neighbour who is neglectful of his orchard trees, it will better pay us to do his spraying for him, without charge, than to let him keep a breeding home for orchard and garden pests. The Ohio Agricultural Station warns us that the San José scale, to be fought with any success, must be fought co-operatively. Professor Webster says, "You can have no idea of the difference in the results of spraying for the San José scale, if all surrounding the premises are alike treated."

Ideal spraying can only be carried on during perfectly calm days; and we must be careful to select a time when a shower will not wash away a large part of our work, before the insects have been affected. A very rainy spell of weather occuring during the spraying season, will undo much of our work and prevent more. So it happens that, do the best we can, our orchard competition is not always at an advantage against the insects. Fungoid diseases, especially, are liable to get in a sorry piece of work, while we are hindered from combatting or preventing.

It is a mistake to consider spraying a work outside of the regular and absolutely requisite labour on a fruit farm. It has become as legitimate a part of work as pruning and cultivating. Still the majority are growing fruit by the doctrine of chances. They may

get a reasonably good crop one year out of five, whereas there is no other crop that can be made so sure as that of the orchard. The real hard work was done by our pioneers. It was wonderful to see Riley, like a knight errant, start out to face the invasion of Rocky Mountain locusts. The sky was thick with them, and every green thing devoured. Yet they were fairly met and conquered by science. The hop louse was a myriad, dodging us through the strangest transformations; yet Riley traced it through our plum orchards, and then into the hop yard; nor did he let up until we understood it so well that we might master it. These scientific labours began a new era; and they are slowly calling out the dormant energies of our fruit growers.

CALENDAR — Spray calendars have been multiplied of late; and I shall give a digest of one of the best, published by the College of Agriculture connected with Cornell University.

Calendar Apple — For scab, use (1) copper sulphate, before buds break; (2) Bordeaux, before flower buds expand; (3) after blossoms have fallen, Bordeaux; (4) repeat every ten days for one month. For canker worm, apply Paris green or arsenite of lime when caterpillars first appear; repeat every ten days, for three applications. For bud moth, use Paris green as soon as bud breaks, and repeat two or three times. For codlin moth, Paris green as soon as blossoms have fallen; repeat twice, ten days apart. For San José scale, lime, salt, and sulphur mixture as already described. Remember that this mixture is equally valuable for bud moth, etc.

Cherry — For black knot, use knife, and spray with Bordeaux several times; beginning very early in the spring. For rot, use Bordeaux. For aphis, kerosene emulsion, quite strong and very

promptly; repeating ever three or four days. The lime, sulphur, and salt mixture is said to be effective. For curculio, jar the trees as described in chapter on plums. For slug, apply hellebore and arsenites combined, and do it promptly.

Currant — For leaf blight, use ammoniacal copper carbonate; and after fruit is harvested apply Bordeaux. For worm, apply arsenites, with hellebore, as soon as the first larvæ appear. If a second crop hatches, use hellebore without the Paris green, lest you poison the fruit.

Gooseberry — For mildew, use Bordeaux mixture before the buds break; and if necessary, later, potassium sulfide. For worm, treat the same as the currant.

Grape — For anthracnose, swab with a solution of copperas, before the buds break in the spring; later apply Bordeaux mixture. For black rot, use Bordeaux as the leaves begin to expand, and repeat several times later. For ripe rot, apply Bordeaux. For leaf hopper, use whale oil soap — one pound in ten gallons of water, and sprayed sharply against the underside of the leaves.

Peach — For brown rot, apply copper sulphate before the buds swell, and later apply Bordeaux mixture. For curl leaf, use strong Bordeaux mixture before the buds swell, and again later. For curculio, jar the trees and catch the beetle. Nectarine and apricot should be treated as the peach.

Pear — For blight, cut off affected branches, sawing several inches below the infection. Burn the removed wood. For leaf blight and fruit spot, use Bordeaux mixture, before the blossoms open, and repeatedly after. For psylla, use kerosene emulsion, or whale oil soap, and quassia solution, repeatedly through the season. For slug, use hellebore and arsenites combined.

Plum — For brown rot, use copper sulphate solution, before the buds swell, and Bordeaux later. For leaf blight, use Bordeaux mixture repeatedly through the season. For black knot, use Bordeaux mixture, beginning very early in the season; and use the knife. For curculio, jar the trees, and spray with arsenites. For scale, use kerosene emulsion in the fall and spring; and lime sulphur and salt mixture.

Quince — For leaf blight, use Bordeaux, beginning very early and repeating. For blight, treat same as the pear; for curculio, treat same as plum; for scale, treat same as apple.

Raspberry and Blackberry — For anthracnose, before the buds break, use copper sulphate, and later use Bordeaux mixture repeatedly. For orange rust, cut out the plants and burn. For saw fly, use arsenites when leaves have expanded; and two or three weeks later apply hellebore repeatedly. These remedies are all only partially effective — except destroying infested canes.

Strawberry — For leaf blight and mildew, use Bordeaux very early; and for worms at the roots, dig up plants, and if necessary change location.

FORMULÆ — Although I have largely covered the question of formulæ, it will be convenient for my readers to have a few recipes. It must be borne in mind that all formulæ vary somewhat as made up by different Experiment Stations, and as reported in the Bulletins. In fact it is possible for an experimenter to vary these considerably without doing any harm.

Arsenites — Paris green mixture may be made as follows; Paris green one pound; quick lime one pound; diluted with one hundred gallons or more of water. This is used for insects that chew. If London purple is used, add two or three times as much lime.

White arsenic is cheaper than Paris green, and of more constant strength. It is growing in popularity with our best experimenters. One formula is four pounds salsoda crystals; one gallon of water; one pound of white arsenic. Boil until dissolved. One gallon of stock solution should be the result; if not, add water. Use one pint of this solution with fifty gallons of Bordeaux. Another formula is, one pound salsoda crystals; one gallon of water; one pound of white arsenic, and boil until dissolved. Add two pounds of fresh-slaked lime, and boil twenty minutes. Add water to make two gallons; use one quart to fifty gallons of water.

Bordeaux Mixture — A safe recipe is copper sulphate (blue vitriol) six pounds; quick lime four pounds; water fifty gallons. For peaches and Japanese plums use more lime, and twenty more gallons of water. Where soda is used, make up according to the following formula: soda two pounds; copper sulphate six pounds; lime less than one pound; water sixty gallons.

Lime, Sulphur, and Salt Wash — This preparation is made according to recipes that differ a good deal. I have already given Mr. Porter's recipe, that is sulphur fifty pounds; salt twenty-five pounds, unslaked lime fifty pounds. The Cornell University formula is lime fifteen pounds; sulphur fifteen pounds; salt fifteen pounds. For fuller directions concerning this mixture, which is of growing importance, send for Bulletin 217, of Cornell University Agricultural Experiment Station, at Ithaca, New York.

Hellebore — This is known as white hellebore; and is prepared by stirring one ounce of hellebore into three gallons of water. I find it very desirable to use this with kerosene emulsion, in order to keep the hellebore and water thoroughly combined.

Kerosene Emulsion — Dissolve half a pound of hard soap; add

one gallon of kerosene, and churn with a pump until the mixture appears like soft soap. On fruit trees this can be used very strong; but applied to delicate foliage it must be diluted ten or twenty times.

Tobacco Water — Soak tobacco stems in hot water, for several hours; and dilute the liquor three to five times; sprinkle on soft-bodied insects.

Whale Oil Soap — Dissolve the soap in hot water; use two pounds to one gallon of water, for San José scale; and on other scales and aphis use one pound to five gallons of water.

Dust Spray — Use one barrel of fresh lime; twenty-five pounds of copper sulphate; five pounds concentrated lye; twenty-five pounds powdered sulphur; six pounds of Paris green. Break the lime into small lumps in a large shallow box. Dissolve the copper sulphate in six gallons of boiling water. Dissolve the lye in five gallons of hot water. Sprinkle the copper sulphate over the lime; and then sprinkle with the lye water. Screen the lime through a fine sieve; then rub the sulphur into the lime; add the Paris green; thoroughly mix the whole. Be careful — for the lime will become very hot. Other dust sprays are recommended. The subject is being investigated, and reported upon by several Experiment Stations. There are already several machines on the market for applying these dusts to plants and trees.

The Missouri Experiment Station has a special dust mixture, which it strongly recommends. Instead of giving their formula, which requires considerable work in the making, I shall leave my readers to send for Bulletin No. 60, of the Missouri Experiment Station.

Petroleum — The use of petroleum or kerosene, for spraying

trees in their dormant state, is frequently recommended of late; and more especially as an effective remedy for the San José scale. I am not sufficiently confident of the final good effect of this work, to recommend it. Professor Budd reports that apple trees that have been well drenched for two successive years, show clean bark and general thrift, not found on unsprayed trees. Others report a vast amount of damage done. Those who are not experts should confine themselves to the use of kerosene emulsion.

I strongly recommend that you have somewhere, connected with your wagon-house or barn, a special room, where all poisonous materials may be stored, and safely locked against children or animals. In the poison-room should be also stored the pumps and barrels of mixtures. This will require, on a small homestead, a room twelve by twenty; for a large orchard, where spraying outfits with tanks are used, the room should be considerably larger. In the storeroom should be low shelves, with labelled apartments or boxes, for hellebore, copper sulphate, paris green, lime, salt, sulphur, etc. The only material that cannot be bought wholesale, and stored in bulk, is lime. This in order to be of proper strength must be frequently renewed.

Several admirable pumps have been devised lately, and I think any one of three or four popular nozzles will do good field work. I am myself using the McGowen. The pump should be strongly made, and of good size. It should be constructed so that it can be easily taken apart for the examination of valves. It is easy to hinder work, rather than advance it by an accumulation of all sorts of devices.

In my poison- or outfit-room you will find always on hand a tub of kerosene emulsion, or a large pailful of this material. As only

a half pint is needed to a pailful of water; for most spraying, a pailful of the solid emulsion will go far on a small homestead. Next in importance will be the material for prompt preparation of a barrel of Bordeaux mixture, or arsenites. One barrel is enough for both these preparations. This barrel, or large keg, is rigged to swing between shafts and wheels. The shafts must widen out sufficiently to accommodate the horse; but the keg and wheels must be so closely rigged that you can drive between rows of berries. The barrel, when mounted, sits down into a very solid iron hoop, which takes the place of an axle. On each side of the hoop are welded axle-ends, on which the wheels are mounted. This rig can be driven through a potato field without doing damage. About ten feet of hose is connected with the barrel, ending with spraying apparatus and nozzle. When the cart is in use, one person is needed to drive and pump, another to direct the spray. If the horse is not very steady, a third person will be needed as driver. It can be easily used on level ground, and for short distances without a horse. With this apparatus we spray currant bushes with hellebore and Paris green; many things with arsenites; and everything with Bordeaux mixture.

The cost of the whole outfit will be ten to fifteen dollars; and it will last many years. The hose will need renewing once a year. This apparatus will serve in vegetable fields, also for rosebeds. If you have a shop, as you should have, the cost of construction can be greatly reduced by home work.

CHAPTER FOUR

BEES; BIRDS; FOWLS; ANIMALS; IN THE ORCHARD AND FRUIT GARDEN

ONE of the most wonderful things in this world is the bee; and the most remarkable bee is our common honey-bee. It is just exactly made to bring two badly fitted parts of nature into adjustment. No matter how grand the florescence, there will be little fruit on most of your trees and vines, without cross-pollenation. This cannot as a rule be accomplished by the wind. The bee just fits into the gap. It is covered all over with fuzz, which constitutes a natural pollen brush. Wherever it goes to collect honey and food for the young bees, it is obliged to crawl in among the anthers, and by doing so mixes the pollen of different vines, or shrubs, or trees. What the bee is purposely doing is to gather nectar and pollen for home use; but while doing this, it accomplishes one of the most important functions in the way of fruit development, and fruit breeding. Mr. R. M. Kellogg tells us, that when he grew orchard trees in the Eastern States, his neighbour's bees worked for him; but when he went into the West and undertook to grow strawberries, where there were no honey-bees, his fruit was imperfect, until he went into the bee business.

Nature is neither careless nor stingy. Her law is betterment and progress; and bees are one of her special provisions in the way of fruit evolution. There are no less than 1878 different species of wild

American bees already described; and they are all needed. If all bees visited indiscriminately every sort of flower, pollen would be deposited where it would be useless. It is necessary, therefore, that each kind of bee shall prefer certain kinds of flowers. There are bees that never visit more than one sort of flower. The mouth part of each species is specially suited to the flowers they visit. Those with long tongues suck the nectar from long tubular flowers, while those with short tongues serve shallow flowers, and get their food from them.

Failure in the fruit crop is often due to such cold or damp weather that the bees cannot fly during the blossoming season. Although some plants are able to self-pollenize themselves, it is even then better that they shall be cross-fertilized by pollen from other flowers. Darwin assures us that "Nature abhors perpetual self-fertilization." Professor Waugh shows us that there are some flowers, entirely sterile to their own pollen; but that these can be fecundated with pollen from flowers growing on another plant of the same species. He has proved this with the American plums; and others have demonstrated the same truth with apples and pears. In order to secure the help of bees, it is much better to keep a few hives of our own. Every one who has five or ten acres of fruit should have at least five or ten hives of bees. As a rule neighbours' orchards will be visited by these bees, and if the range is likely to take in several orchards, twenty or thirty hives will not be too many.

The care of bees, including a very wholesome fear, debars many from cultivating their near acquaintance. However, in every family of four of five some one will be found who will naturally take to bee culture. The modern hive is a home so well constructed for sum-

mer comfort, and may be made so warm for winter, that few hives will perish with even ordinary care. In addition to the orchard garden, flowers are a welcome addition to the food range of an apiary. Still more important is it to have a grove of lindens or basswoods. This is one of the very best street trees in America, and I have secured, recenty, the planting of a large number in our town avenues. This should be done everywhere as an economic measure — adding thousands of pounds of honey to every township.

If your hives are in the orchard, or very close to it, the bees will fly between showers, and accomplish a great deal in a short time. I am almost certain to secure apples and pears when the crop is a failure in general. It is equally important that the bee shall serve those flowers that are of themselves self-sterile. I shall not soon forget a savage letter from a vineyardist of the Hudson Valley. I had praised the Brighton grape, as it well deserves to be praised. He had planted a large vineyard of this variety; and for four consecutive years had not got a bushel of decent grapes. He declared the Brighton grape to be a nuisance, and plowed up his vineyard. What he wanted was a good intermixture of Wordens, and other pollen-bearing varieties; and bees enough to insure cross-pollenation.

Lately some efforts have been put forth to invoke the law against keeping bees, where neighbours are near. The result has been to establish the bees legal status, as soundly as that of domestic animals. By law, bees kept for honey, or for work in the orchard, are absolute property. The bee-keeper is liable for injuries done by his bees only where negligence can be proven. The fact is that an apiary is of benefit far beyond the limits of its owner.

I have neighbours on three sides of me, whose orchards are evidently greatly dependent upon the service rendered from my hives. It is true, however, that bees may do damage. It has been proven that when some forms of fungus, like pear blight, are about, bees distribute the germs and spread the disease. The damage done is, however, very sporadic, and in no way comparable with the good accomplished. It is not true, however, as often asserted, that honey-bees destroy fruit. A careful examination will satisfy any one, that while the bee works in berries and grapes, and bruised fruits, he does not originate the bruise. In your vineyard it is much more probable that the oriole has gone ahead and punctured the grapes — to be followed by bees of different sorts.

I have become so warmly attached to my little allies, that I am inclined to add an enthusiastic and poetic, but very true passage, from Professor Tollingwood. "The bee does a fair day's work, and then goes home, and puts in a part of the night. A man, after doing his work in the field, will hardly help his wife wash the supper dishes, but the bee works like a slave through the darkness, at the wonderful task of manufacturing honey. The short day of hard and persistent work furnishes enough for the hive worker If all men worked as the bee does, with as fair and just a division of labour, what a world we would have! The short hopeful days work would be sufficient, if the idle would cease to live on the earnings of the overworked. The society in the hive permits few drones, while human society increases the number. There is no question about the debt that we fruit growers owe to him. People talk about the wind, and other insects, in fertilizing our flowers, but I am confident that any man who will investigate for himself, will see that the honey-bee is nearly the whole story."

BIRDS—Recent study of birds has put them in quite a new light in relation to the farmer and his crops. It is clearly established that a fruit grower cannot expect to successfully combat insect rivals without the help of his winged allies. The more we improve our agricultural methods, and reduce the land to garden crops, the more we stimulate the development of predatory insects. A recent writer says, "We believe that not only is the success of our farmers dependent upon the help of birds, but we believe that without them man would have to vacate the land. The robins, the sparrows, the grosbeaks, and most of the thrushes destroy vast quantities of insects, while the goldfinches and other seed-eaters are of almost equal use, by destroying the seeds of noxious plants. The swifts and the nighthawks who sweep the air of moths and flies are of equally fixed value."

During the last few years nearly every state has entered on its statute book laws intended to protect beneficial birds. Occasionally a law has been proposed, or passed, permitting the destruction of species of great importance to the fruit grower. New Jersey has twice killed a bill allowing the shooting of robins. An effort to protect the wild pigeons failed for three years, and until public sentiment forced the governor to call an extra session, to pass "The Pigeon Bill." It is hoped that there will be a unanimous agreement, to prevent the killing of our Northern birds while wintering in the South. At present our robins, and catbirds, and vireos, and thrushes, too often find their way to the pot or toasting fork of New Orleans epicures. Ohio is the only state that has gone backward; and enacted legislation permitting the destruction of the wild dove.

In all this legislation we have been guided largely by the Bulle-

tins sent out from the Experiment Stations of the States, and from the Agricultural Department at Washington. I am sorry to say that most of these advocate the equal protection of our best friends, and hawks, crows, and owls. In most sections I am not sure that owls are doing any serious damage, but the record of the crow and some of the hawks is very different. I am constantly obliged to keep a gun within reach to prevent crows from tearing up robins' nests, and devouring the young. I have seen a black rascal sit on the edge of a nest, and with much deliberation and blinking, select the fattest of the youngsters to carry away. It is probably quite true that the stomachs of a hundred crows, examined at Washington, had no robin in them; that does not imply that other crows have not been more fortunate in their hunting. They herd by the thousand in chosen localities and while doing some good work as scavengers, are a pest beyond question. All song birds hate them, and chase them out of the neighbourhood if possible. Several of the hawks may be useful, but those which build their nests near our chicken coops and fruit yards, destroy birds as well as chicks if possible. I have seen one with a robin in his claws, and a dozen birds chasing him with great outcry. On the whole, however, legislation is taking the right direction. The list of outlaws among our common birds includes mainly the crows, blackbirds, and English sparrows, with a part of the hawk family.

Bird culture is not to be considered the same as bird protection. The latter is an effort, by intelligent means, to encourage the multiplication of species that are most helpful. This is by no means a difficult matter. We need not feed our robins the bulk of our cherry crop and our berries, in order that they may dine well. A Tartarian honeysuckle hedge will pay a fruit grower simply as a

home, windbreak, and it will also be a decided advantage to a rural purely from the æsthetic standpoint. But just as your raspberries ripen and your cherries are a temptation, the hedge will be loaded with berries that are very attractive to those birds that love cultivated fruit. By this one device alone you can supply bountiful food for all the robins and catbirds that will find homes with you, or near you, during the berry season. The high-bush cranberry is equally valuable in late autumn, throughout the winter, and in the early spring. All the wild cherries give a vast amount of bird food; and planted along fence lines they draw the birds away from Governor Woods and bigarreaus, blackberries, and grapes. Professor Beal of Michigan, advises planting the native shadberry and the Russian mulberry, to protect cherries; and the elderberry and the choke-cherry to protect raspberries and blackberries in July and August. In September and October those birds which meddle with peaches and grapes are fond of the fruit of the Virginia creeper, which may be easily grown over old stumps and stone fences. A supply of winter food should include mountain-ash berries, viburnum, poke-berry, barberry, hackberry, and dogwood.

Observe that it is quite important to keep insect-eating birds with us, and at work all winter. This can be easily done if our farmers' daughters will hang out lumps of suet in the vines and trees about their houses, for nuthatches, chickadees, purple finches, and woodpeckers. Mrs. Davenport of Vermont, enumerates among those birds which she retains all the year, nuthatches, song sparrows, linnets, juncos, robins, bluejays, and even orioles. She feeds these with hemp seed, cracked corn, sunflower seed, bread crumbs, and a bread made of one-third wheat and two-thirds Indian meal.

All the brighter days of winter the birds will be out in the orchard, changing their diet, and assiduously hunting insects, eggs, and cocoons.

I do not desire to go around the problem that presents itself to us, when the birds, especially the robins, take every cherry from a pet tree, or entirely carry off the berries from a small garden. I do not wonder at the impulse to kill the birds. Of course the plan I have suggested of counting them into the family as domestic aids, just like horses and cows and dogs, is the right one. But where our neighbours are growing little or no fruit, and we have only a very small garden, this solution of the problem is impossible. We are obliged in such cases to add an artificial provision. I have sufficient trouble with my birds during the cherry season, to compel me to cover a large number of trees with mosquito netting. The cost of such coverings is all the way from one dollar for a small tree, to four or five dollars for a very large one; and there is a good deal of trouble in putting them on. However, they ought to be usable for about three years — if properly stored. Cherry trees will bear from one to three bushels each; and will sell at from two to three dollars per bushel. Of course our steady effort should be to induce the planting of cherries, all over the country, so freely that the birds will have all they want. Twenty years ago when raspberry culture was much less common, the work of the birds was very noticeable; but now, while the birds are far more numerous, the subtraction of their share of berries does not disturb us.

I cannot leave this topic without telling the truth about the English sparrow and the beautiful oriole. This imported sparrow is absolutely unlike any one of our native species; it is quarrelsome, it frequently breaks up the nests of other birds, and it does more

or less picking into our fruits. If there be any good reason for sparing this sparrow, I do not know it. I find that having turned my homestead into a bird paradise, all the other birds refuse to tolerate an English sparrow inside our demesne. The oriole is one of the most useful birds that we have in early summer, to destroy lice on our fruit trees; but later in the season he seems possessed of the spirit of mischief. In a couple of hours a single bird will have jabbed his bill into nearly every plum on a tree of Abundance. Fortunately he leaves his Northern home about the first of September; but if the grapes ripen early, he will have got in some very bad work in the vineyard; and we shall have bushels upon bushels of the choicest grapes picked open, not eaten, by the chattering rogue. The bees follow him and the hornets, and use up what he has spoiled.

In spite of good laws, the destruction of valuable birds goes on very extensively near our large cities. Farmers find their fields invaded by people from the towns, mainly young Italians, who kill robins and song sparrows. The New York State law provides that wild birds, other than the English sparrow, crow, hawk, crow blackbird, snow owl, and great horned owl, shall not be taken or possessed at any time, dead or alive, except under authority of a certificate. No part of the plumage, skins, or body of any bird thus protected, shall be either sold, or had in possession for sale. It is not necessary for any one seeing an infraction of this law, to swear out a warrant, in order to arrest the offender. Any one can put him under arrest. Any person who violates any provisions of the law, is open to a penalty of sixty dollars; and to an additional penalty of twenty-five dollars for each bird or part of a bird taken or possessed. It is a model statute.

SHEEP, SWINE, AND HENS — In the economy of orchard culture we must also take into consideration the utilization of swine, sheep, and fowls. I have never seen better apples than those which are grown where sheep are grazed. The dropped apples are gathered as soon as they fall, and in this way the larvæ of destructive insects are prevented from entering the ground. The soil is evenly fertilized by the sheep droppings, which do not immediately dry up, like scattered barnyard manure. Such an orchard should be plowed once in three or four years, applying a cover crop, to be turned under in the spring. Hogs allowed to run in an orchard, also devour the wormy drops. In either case the trees must be trimmed sufficiently high to prevent pulling at the branches. Rooting up of the sod will do more good than harm.

A very judicious plum grower writes that he has a twelve-acre prune orchard, in which he allows five hundred fowls a free run; and it has proved a very advantageous experiment. He says, "We use the colony system, having twenty-five fowls in a colony, and twenty colonies. The houses are placed two in each acre; and are six feet by sixteen. Two sixteen-feet sills of each house are of grub oak, with natural crook at one end. These act as runners, to which a team is attached, moving the house once a week. This saves house-cleaning, and leaves the manure where we want it to fertilize the trees. The move results in such a slight change of location that the fowls do not become bewildered. They run among the trees, enjoying the shade, bathing in the dust, and picking up insect pests. A cover crop of vetch is sown in the orchard, after the last cultivation; this furnishes green food during the late fall and spring. The benefits of this system are manifold; and the only objection is that, when cultivating the orchard, as we do every ten

days, we are obliged to drive around the houses. We secure double use of the land; we save expense of cleaning house and hauling manure; we get aid in subduing insect pests; and we have shade for our fowls. Beside this we get the eggs and all the profits of a first-class hennery." This admirable description is taken from an article, by Charles A. Walker, in "Western Fruit Grower," of Missouri, and is a capital illustration of how orchard work may be made co-operative with other branches of farm work.

The family cat, useful as he is in some ways, is a marplot in planning an ideal orchard and fruit garden. Where the homestead is small, the cat succeeds in destroying nine birds' nests out of ten; and, unfortunately, the very birds we most need to multiply — such as the catbird, indigo bird, robin, and song sparrow. I like a cat, but I cannot allow all my best laid plans to be circumvented by these unscrupulous carnivora. They are not much needed during the summer months, and I strongly advise that you furnish your grimalkin with summer quarters, where he can have good shade, with shelter from showers, a backyard and a frontyard; and all securely under wire netting. Feed him well, and talk with him once in a while; but don't let him loose until the birds' nests are empty of fledglings — sometime in September. His house should have a tin roof, or be neatly shingled.

CHAPTER FIVE

HARVESTING AND MARKETING

PICKING — If your market is near, fruit should be placed upon it when exactly ripe — but not dead ripe, or over ripe. Most of our fruits, as we obtain them from dealers, do not have a perfection of flavour. Growers of such fruits would not eat them; they know better. In their own orchards the fully ripe fruits have a perfection of quality that is not found in that which is marketed. Plums are hauled off in all stages of colouring, and are seldom in any reasonably good condition for consumers. Cherries, sour cherries particularly, should remain on the trees until the colour is quite dark. Birds often drive the grower to gather his fruit contrary to his own judgment. Fungus attacks on the cherry create rotting in many cases, just at maturity, making it necessary to pick prematurely. If shipments are to be made to a distance, it is necessary to gather fruit before it softens. Peaches must be placed in the baskets while hard. If berries are to be shipped, it is all important that they shall not be soft when placed in the crates.

There are a few exceptions to the general rule, that fruit should be fully ripe before gathering. Pears left to ripen on the tree never, or very rarely, develop the rich flavour which should characterize them. They must be taken from the tree several days before they are soft and eatable — as soon as the stem will snap off from the

spur on which it grows. This is true also of Japanese plums, that their quality can be determined only by picking before complete ripeness, and allowing them to finish their colouring and flavouring indoors. Store both pears and plums in dark, cool rooms. If picked carefully, leave them in shallow baskets. If they need sorting, do it at once — removing defective fruit, and storing the better grade in shallow baskets or bins. It is equally important that berries, cherries, plums, peaches, and nearly all fruits be picked when dry; and at least packed for market when dry. If persistent showers occur during the picking season, fill your baskets half full, until the water has evaporated.

Nothing like enough attention is paid to picking with care. Most fruit growers seem to be uninformed as to the need of handling fruit with caution. When shipped to market it is tumbled about with reckless ignorance. When stored for home use it is thrust into the cellar as roughly as potatoes. Economy will always allow time enough for the utmost care in gathering. To break one cell in an apple is to start decay. The least pressure spoils a peach or a plum. Berries cannot be handled too delicately. If the pickers squeeze them they will hardly reach a near market before mould has begun. While gathering orchard fruits never break off the bud stem. A judicious picker will slightly turn an apple or pear upward with his hand, and loosen the fruit stem from the spur. If these spurs, which are generally loaded with next year's fruit buds, are broken off, the careless picker is removing two years' crops at once. In many orchards you will find the ground literally covered with these spurs. Such orchards will have but little fruit alternate years.

Fruit should never be left in the field after picking, Berries

should go to a cool room, just as fast as they are gathered from the bushes. Pack the boxes in crates, keep the crates in the shade; and as soon as a crate is full, hurry it to cool storage. Neither should apples or pears ever be piled on the ground — certainly not if it is intended to store them or ship them to a distant market.

In gathering orchard fruit use step-ladders as far as possible. Where trees are headed low, as they nearly always should be, step-ladders will be sufficient for gathering the crops, until the trees are twenty years old. The careless use of ladders against the limbs destroys an orchard with ten years of picking. Discharge a man at once who throws ladders against the limbs, or drops or tosses apples into baskets, or pours them into wagons or barrels. Pick into smooth baskets, always provided with hooks; place carefully in wagons; and remove at once to a storage-room. Handle the fruit as few times as possible; and always *handle* it. It takes a little more time, but it is economy in the end. Picking-bags, and other devices, are not desirable for any fruit that can be gathered by hand.

GRADING — Grading is essential to success in fruit growing. Send only first-class fruit to market. Make your brand like your bond. After a little while it will sell your fruit for you. Fruit for the cellar should be so graded that you have no more sorting to do in the winter. Gould says very truly that markets are "seldom glutted with strictly first-class fruit"; but it frequently happens that the poorer grades are a burden at any price. A market where a large part of the fruit goes to canneries will not be so critical, but honest grading and packing are always essential. "It sometimes happens that the grower's standard of grade and quantity are below those

of the market, and while he thinks he is packing for the grade intended, he is disappointed in the returns from the commission house."

PACKING — Packing is an art; but it must be learned, or you will make a failure with your business. Berries must lie just as loosely as possible in their boxes. Every care must be taken not to have them jarred or settled down. On the other hand, apples and pears must be packed tightly. When placed in barrels, or boxes, they must be so pressed that shipping cannot possibly loosen them. You will, in the long run, find that by packing a barrel with an even grade clear through, you have secured a permanent market; while a "faced" barrel will catch the eye of the purchaser, but he will soon learn that this does not necessarily mean honest apples lower down. You always lose permanently by a lie, to secure temporary advantage. There is neither cash nor character in falsehood. The proper package for shipping is always modified by fashion and locality. Just now currants are shipped in boxes, like berries. Cherries seem to reach the consumer better in three to five-pound baskets; and grapes in packages of about the same size. The old-fashioned peach basket is giving way to a more rational square-cornered basket. These are questions the shipper cannot always settle for himself.

STORAGE — The fruit grower must not consider storage as a business by itself. The iced or the chemical storehouse may not be possible for every orchardist and gardener; but it is possible for each one to have a cool, dark storage-room, or a cool, dark, and not too dry cellar — both of these in one perhaps. There is no use

growing what we cannot take care of. And yet the great loss in fruit results to-day, from the fact that the large majority of growers have no storage places suitable for preservation of their apples and pears; and no cool storage-room for the temporary storage of berries, and such fruits as must be hastened to market. Orchards are planted, while the house is built on a dug-out, or has a cellar provided with a furnace. It is not a difficult matter to have proper, adequate provision for the storage of one or two hundred barrels of apples and pears. My own cellar is a room underneath my carriage-house and a part of my barn. The walls are of double thickness; ventilation excellent for summer; easily closed tight for winter; while a brook runs through the soil — carried in tiles — keeping the air moist, but not too damp. It is an essential to a good storage cellar that it be not so dry as to rob the apples of moisture during storage. In a dry cellar the shrinkage of fruit is a very important item. Mine is divided into two apartments. One of these is provided with bins for first-grade fruit, and can be kept closed all winter, with the thermometer at about thirty-three. The other apartment, which is more open, serves as a packing-room, and temporary storage-room for fruits that should be hurried to market. It often happens that a market is glutted with Bartlett pears, or some other stock, and it is very desirable to hold over your supply for a few days, or weeks. This can always be done in a cool, dark, storage-room. I have not found that for winter storage it makes very great difference whether apples and pears are placed in shallow bins, or in barrels.

Dr. F. M. Hexamer, in his "Cold Storage Fruit House" tells us that the "simplest and least expensive method for farm use is to build a two-story ice-house; the ground floor for the storage of

fruit, and the upper for ice. The most important part of such a house is the proper construction of the dividing floor, upon which the ice rests. The timbers, the size of which depends upon the quantity of ice to be supported, are so arranged as to have narrow openings between one another, to permit the cold air from the ice chamber to descend to the storage-room, and facilitate the dripping of the water from melting ice. To prevent the water from falling on the fruit, an additional floor or roof must be constructed under the dividing floor. The best material for this purpose is galvanized iron, so arranged that all the water flows off into a gutter, through which it is carried into the main drain." Summer pears, grapes, cherries, and berries require dry rooms. The furnace cellar, or common house cellar is generally in a condition, during the summer months, for this sort of storage.

The Virginia Experiment Station describes a storage building constructed for the Station, as follows. "The essential features are: first, a cellar excavated into a gently sloping hillside, carried into the bank far enough to place the cellar room entirely below the surface of the earth, and yet give opportunity to enter easily, by an inclined way from the lower side of the slope; second, a flue, leading out from near the centre of the floor of the cellar room, along the bank of the hillside, for a considerable distance, with sufficient fall to make it act both as a drain pipe and a fresh-air flue; third, ventilating flues, placed at each end of the cellar room, and rising to the height necessary to give a sufficient draft, to carry off rapidly the air from the cellar room, whenever ventilation is desired." Each fruit grower must make a study of this subject, and settle the question for himself; but provide good storage he must.

MARKETING — If you live anywhere near a city, get your own customers, and serve them directly. Do this on the principle of absolute honour, and you will find your market expanding quite as rapidly as your gardens and orchards increase their produce. In several of the states there are laws which allow a reasonably close relation between the grower and his private customers. Such laws should be universal. The middleman is essential, but he should not be allowed to enact laws, or have them enacted in his interest, to separate the orchardist or gardener from the purchaser of his goods. In many cases he imports from a distance, berries, currants, pears, cherries, and other fruits; regulates the market price with these imported goods; and then compels the local grower to take his stand in the market-place, and watch for a chance to secure any sale at all. Most local growers, after standing in a market, or having trailed their goods from store to store, only to find goods shipped from a distance forestalling them, become disgusted with the business. The result is utter demoralization of fruit growing, on a small scale. The remedy is absolute honour in grading; neatness and care in packing; and the securing of private customers.

Where goods have to be shipped to a distance, the middleman or broker becomes a necessity. The only possible advice is to take special care to secure a reliable dealer. He generally demands ten per cent on his sales.

The foreign market is just now a matter of supreme importance. The farmer, including the fruit grower, has learned that he does not need to have the home market held for him against foreign competition. He has possession by right of his skill, his tact, and his energy. It is by these alone that he expects to keep it. But be-

fore 1890 he had already glutted the home market; and was burning his corn for fuel, feeding wheat to his hogs, and selling his apples to speculators at fifty cents a barrel. The search for foreign markets opened into an era of commercial expansion. In 1895 our trade balance climbed up to nearly one hundred millions; and of this whole amount four-fifths came from the farm. Not only corn crossed the ocean, but apples began to find a market in Liverpool, and to create a demand in Berlin and Vienna. Our first shipments of peaches and pears resulted in loss, from lack of experience in packing; but those that reached Liverpool sold at such prices as stimulated further experiments. The demand is steadily increasing for all first-rate American fruits — and at higher prices.

The effect has been excellent in the way of compelling our fruit growers to eliminate inferior sorts; and adopt methods of picking and packing commensurate with the importance of the market. The Agricultural Department at Washington is making a special study of this subject. Several experimental shipments have been made of summer apples, peaches, and autumn pears, as well as winter apples. The results indicate that the first named products can be landed in European markets in good condition, if proper care is exercised in picking, packing, and shipping. It is proposed to send an experienced man to each of the centres of foreign trade to study conditions and handle shipments.

George T. Powell, in a report to the Commissioner of Agriculture of New York State, says: "Only good fruit is wanted abroad. The fruit grower should begin months in advance to secure good quality, by practising good tillage, efficient fertilizing, and thorough spraying. Red apples sell better than solid green ones, as a rule. Apples intended for export should be picked somewhat

earlier than for the home trade — but not when immature. Barrel and ship as soon as picked; rather than store the fruit for some days in piles in the orchard. Very fine fruit should be marked Fancy or Selected; with four Xs, and with the grower's or the shipper's name or initials. The second grade should be marked with three Xs. Nothing lower than this should ever be exported. In the English market American fruit is sold by sample, at auction. Badly packed fruit is sold at a separate auction, and does not pay the grower or the shipper." Meanwhile the Oriental market, including China and Japan, is steadily opening for Pacific-Coast fruit.

For foreign shipments the box has almost entirely displaced the barrel. The ocean freight on a barrel of apples is usually sixty cents. The railroad freight charges discriminate; and that is our chief trouble in exporting. A full car load is about two hundred or two hundred and twenty-five barrels. The same car would hold six hundred to seven hundred apple boxes. Carried in the ship's refrigerator chambers, the charge is $2.40 per ton. There are some charges for dockage and cartage after landing. The style of box now mostly recommended is open between the slats; somewhat like a berry crate. The Orleans, manufactured by the Montgomery Box Co., of Buffalo, is one of the best. Exports of fruit increased from two millions value in 1884, to three millions value in 1894; and from 1894 to 1904 leaped up to twenty millions.

CHAPTER SIX

PLANT BREEDING

ONE of the earliest facts that a fruit grower discovers is that sex is universal where there is life: and he soon finds out that it must be accounted with in the vegetable as well as in the animal world. Bringing male and female plants into juxtaposition is essential to securing good crops. Cross-breeding of different varieties is essential to the creation of varied progeny. Some varieties have both sexes in the same plant; but even then it is not certain that pollenation will take place. Nature has prepared for the bringing of pollen from other plants, because she abhors in-breeding with plants, as as she does with animals. This we have already seen to be true, especially in the vineyard, and strawberry bed; while it is nearly as apparent in the plum, pear, and apple orchards.

To secure new sorts of fruits, developing novel characteristics, and possible progress in value, we cross two varieties, or two "species." Nature is doing this all the time. Tens of thousands of seedlings are constantly produced in our berry gardens; but most of these are trodden down or hoed out. The chances are that we have in this way destroyed some plants that would have produced fruit of wonderful value.

Crossing may be left therefore to nature; or it may be carried on scientifically. In the first case we must see that nature has the best

stock to work with. For instance, if we have grown in our gardens the Davison's-thornless raspberry and the big Gregg, the qualities of these two superior sorts will reappear in seedlings, with all sorts of modifications. A few fruits are gradually, all the time, becoming fixed and established. These do not take crossings readily, but reproduce in kind very nearly. In this way there are families of apples like the Fameuse, in which all the seedlings tend to reproduce the specific qualities of the ancestor. Where crossing goes on readily, and you have furnished nature good material to work with, the chances almost become certainties that you will get choice seedlings. You may, however, collect a thousand seedlings from wild sorts of berries, or other fruit, and get not more than one valuable plant to a hundred — possibly none. However, keep your eyes always wide open; for the Seckel pear, the Worden grape, and the Bartlett pear, were chance productions.

Scientific breeding is accomplished by our personal supervision, at every step of the process. We select the parents; we carry the pollen or germinal life from plant to plant; we prevent the interference of wind or insects; we sow the resultant seed, and select the best progeny. When nature does the work, you will observe that she has entirely different ends in view from yourself. She prefers dull-looking fruits, so as easily to hide them. She prefers numbers to quality, so as to secure abundant seeds. She prefers thorns, in order to protect her fruit. Not only in the crossing, but in the selection, nature is at odds with you. You will select for your garden and orchard, very likely the very sorts that, if left to grow wild, would soon be run out. Under cultivation you can only in part coax nature to co-operate with you.

When you have a new thing of value in the vegetable garden

your puzzle is to keep it valuable —"to fix it"— so that when you sow the seeds they will not come up with all sorts of sports; a little more of father in this one, of mother in that one, and of older ancestors, in all sorts of proportions. This fixing needs a great deal of patience, and isolation of varieties, for several years in succession. But in the fruit garden, if we get a good thing, we preserve it more easily, either by root shoots, or by grafting. We never let go of the individual plant; or give it a chance to revert to wildness, by sowing seeds.

This chapter assumes that every fruit grower is deeply interested in betterment. It is a growing characteristic of humanity to be dissatisfied. It is the new kind of righteousness that does not content itself with what it inherits. The new idea of man is a co-creator with the Father who "planted a garden eastward in Eden." It is easily within the power of every orchardist and gardener to improve plant stock, as it is within the capacity of every farmer to improve animal stock. To accomplish this he should have in view, beside the general idea of improvement, a specific object of improving at a certain point. For instance, just now we need in our fruit gardens a very much better red raspberry. The Cuthbert was produced some twenty years ago, with so many excellent qualities that it rapidly drove out of cultivation its predecessors. It lacks hardiness, however, and is very susceptible to drought. Who will give us the ideal raspberry? Ideal strawberries are produced at the rate of half a dozen each year; but possibly we have not yet anything like the strawberry of 1950. That berry will probably have long and stout roots, capable of feeding in spite of a drought. It will probably have a fruit stalk one foot in height, and as stout as a currant bush. This stalk will hold berries as large as Sample

and Bubach, and plenty of them. We shall probably grow that berry in hills; and hoe our strawberry fields as we do our potatoes. In our orchards the struggle is sharp for apples and pears with very small cores, or none at all.

While working along these lines of betterment, we are almost certain to find our first seedlings that come into blossom, to be those possessed of the greatest vital force — merely "animalism," as we should say in the stable yard ; but those possessing finer qualities will develop more slowly, and come to fruitage later. Perhaps the very highest touch of pomology as yet in our apple orchard, is the Northern Spy. That variety not only blossoms later in the season than all our other best sorts, but it comes to fruitage quite late — not until it is quite well grown. This complicates our work somewhat, because it protracts the period for testing stock.

Bailey tells us that the more violent the cross the less is the likelihood that desirable offspring will follow. This may be true with the first generation. But seedlings of seedlings will often tell a very different story. Mr. Burbank has crossed very violently, and secured remarkable results. Bailey allows this probability, by instancing Brighton and Diamond grapes — both results of secondary crossing. "Violent hybridization generally gives unsatisfactory crossings; but subsequent crossings, where the blood of the original species in the marriage contract is considerably attenuated, may be expected to correct or overcome the first incompatibility." I have found in my vegetable garden, where crossings can be carried on and tested more rapidly, that some sorts or species are aristocratic — refusing to cross readily. When such wedding of varieties does occur, it comes with stability. Easily crossed sorts on the con-

trary are very frisky; breaking up into all sorts of sports. Crossing currants or grapes shows the same drift. Seedlings of a higher bred sort do not easily revert.

In plant breeding, we have to consider environment quite as much as character of the parents. The growth of trees and plants may not only be greatly influenced by soil, aridity, and freedom from, or character of neighbours, but the character of the fruit will also be greatly modified. Forest trees, as grown on our lawns, are steadily changing their forest habits of growing straight up with long trunks, to a habit of spreading out their limbs from near the root. The stocky, solid apple tree of New England becomes more pliant and spreading in Ohio. Seasons also affect the character of vegetable development — even to the character of the pollen produced, and the seedlings that are grown. Thomas Meehan once wrote to me, "I cannot quite understand why, yet you are correct, that variegated-foliage seedlings will wonderfully show up some years and none on other years." It is the environment of the mother plant, including the air and the weather, as well as the environment of the offspring that must be considered in plant breeding.

Having secured your break into the heredity of some plant, by crossing pollen, you have to pursue your work by selecting the best results; and by choosing the best environments for these, you will learn in time to pull up, very promptly, inferior productions. What we want is not novelties, but progress. We want better, handsomer, and hardier fruits. Perhaps most of all we need fruits adapted to a wider range of climate, and soil.

Mr. Burbank, in his address on fundamental principles of "Plant Breeding," says, "Every plant, animal and plantlet

occupies its place in the order of Nature by the action of two forces — the inherent constitutional life-force, with all its acquired habits, the sum of which is heredity; and the numerous complicated external forces of environment. To guide the interaction of these two forces, both of which are only different expressions of one eternal force, is, and must be, the sole object of the breeder, whether of plants or animals.

"When we look about us, on the plants inhabiting the earth with ourselves, and watch any species day by day, we are unable to see any change in some of them; yet there is not to-day one plant species which has not undergone great, and to a certain extent constant change.

"The very existence of the higher orders of plants which now inhabit the earth, has been secured to them only by their power of adaptation to crossings; for, through the variations produced by the combination of various tendencies, individuals are produced which are better endowed to meet the prevailing conditions of life. Thus to Nature's persistence in crossing, do we owe all that earth now produces in man, animals, or plants; and this magnificently stupendous fact may also be safely carried into the domain of chemistry as well, for what is common air and water, but Nature's earlier efforts in that line; and our nourishing foods, but the result of myriad complex chemical affinities of later date?

"Natural and artificial crossing and hybridization are among the principle remote causes of nearly all otherwise perplexing or unaccountable sports and strange modifications, and also of many of the now well-established species. Variations, without immediate antecedent crossings, occur always and everywhere, from a combination of past crossings and environments; but still further in-

telligent crossings produce more immediate results of great value, not to the plant in its struggle with natural forces, but to man — by conserving and guiding its life-forces to supply him with food, clothing, and innumerable other luxuries and necessities. Plant-life is so common that one rarely stops to think how utterly dependent we are upon the quiet, but magnificently powerful work which it is constantly performing for us.

"It was once thought that plants varied within the so-called species, but very little; and that true species never varied. We have more lately discovered that no two plants are ever exactly alike, each one having its own individuality, and that new varieties having endowments of priceless value, and even distinct new species, can be produced by the plant-breeder, with the same precision that machinery for locomotion and other useful purposes are produced by the mechanic.

"Plant-breeding is in its earliest infancy. Science sees better grains, nuts, fruits, and vegetables; all in new forms, sizes, colours, and flavours; with more nutrients and less waste, and with every injurious and poisonous quality eliminated, and with power to resist sun, wind, rain, frost, and destructive fungus and insect pests; fruits without stones, seeds, or spines; better fiber, coffee, tea, spice, rubber, oil, paper, and timber trees — and sugar, starch, colour, and perfume plants. Every one of these, and ten thousand more, are within the reach of the most ordinary skill in plant-breeding."

I let Mr. Burbank speak at length for himself, because he is our supreme authority along this line of work. He has gone beyond all our old ideas of possible plant relationship, crossing the lines of species, almost as thoroughly as the lines of varieties. He is

now working, specifically, to give the more luscious fruits to those who live where climate has heretofore limited them to wild and inferior sorts. He insists that there is no good reason for permanently producing poor fruit, because in time new trees can be, and will be, produced, which will afford better fruit, with regularity and certainty.

"But," adds Mr. Burbank, "these vast possibilities are not for one year, or for our own time or race, but are beneficent legacies for every man, woman and child who shall ever inhabit the earth. Who can estimate the elevating and refining influences, and the moral value of flowers, with all their graceful forms, bewitching shades, combinations of colour and exquisitely varied perfumes? These silent influences are unconsciously felt even by those who do not appreciate them consciously, and thus with better and still better fruits, nuts, grains, and flowers will the earth be transformed, man's thoughts turned from the base destructive forces to the nobler productive ones, which will lift him to higher planes of action — toward that happy day when man shall offer his brother man, not bullets and bayonets, but fairer flowers, richer grains, and better fruits."

When the farmer plants a bean or a corn grain he should understand that already in those seeds is wrapped up, not only a power of reproduction, but a vast power of permutation and evolution. It was my fortune to carry on a series of experiments which carried corn backward, through some ten years of selecting for reversion, until I had reproduced the original grass out of which corn has been developed. Who, taking his stand with that grass, in the far past, and holding a handful of the seed, all of it gathered, like any grass seed, from the top of the plant, could have forecast

the magnificent maize of the present day, and its relation to the inhabitants of the earth? In that long past day the products of the earth available to human beings, did not support a population over the whole globe, of fifty millions. To-day, with the progress made in turning weeds into fruit-bearing plants, grasses into grains, wild thorns into Northern Spys and Pippins, the earth easily feeds fifteen hundred millions; and looks forward cheerfully to a five-fold multiplication of that number.

The field of animal breeding and plant breeding is one. Professor Whitman, Director of the Woods Hole Marine Biological Laboratory, tells us that the time has come when the farm is more important than the laboratory. The fundamental problems of heredity, variation, adaptation, and evolution cannot be wholly settled indoors. We have reached a point in scientific study when the college and the orchard must strike hands. The study of dead material must pass over to experimentation with living plants and trees. For this reason Professor Whitman makes a stout plea for a "great biological farm." It is certainly a significant fact when our greatest school of research cries out for a more practical and industrial method of investigation. Mediævalism in education, that is, storing the brain with facts, is no longer satisfactory. Industrialism in education reaches out from the primary school in its garden, to the university with its biological farm. The end of study is achievement — ability to co-operate with nature in her continuous creation.

GRAFTING — Propagating a good thing, when we get it, is a sequence of plant creation. For this reason the science of budding and of grafting finds a natural place in this chapter. As soon as

Mr. Burbank has determined all the results of a great experiment, he burns the reversions and the standstills; but he has before him the problem of multiplying the best, with such rapidity that the people can participate with him, in the shortest possible time. Grafting is fortunately so speedy an affair, and so simple in its working, that any one can achieve success. I think I was a better grafter when ten years of age than I am now. Every bit of wood of a new plum or a new apple, every bud even, is of commercial value. Some of these new Japanese cross-breds cost five dollars or more a bud. What can be done with them? We will see that every one shall make a tree, or make over an old tree. The time was, less than twenty years ago, when there was only one Burbank plum in America; but now there are tens of thousands — probably millions; and they are growing in every state from California to Maine. They will soon be as common as Green-Gages and Damsons; all owing to this subtle principle of grafting. Mr. Stark finds some very rich new apple hid away among the farmers — not likely ever to be disseminated. He sends out little bundles of twigs, cut from the last year's growth; and asks a score or more of us, in different parts of the country, to graft the twigs on our older trees, and report to him what we think of the new fruit. If we bought trees of the new sort — only there are no trees of the sort to buy — it would be five or six years before we would get fruit, and be able to pass judgment. But we cut those little twigs in short bits, with a bud on each one, and by grafting into our old trees, we are able to get a knowledge of the fruit in two years.

Grafting and budding are based on the remarkable fact that the cells of a cion will determine the character of the fruit borne by

the grafted limb; instead of the root or the main tree. This, however, is not quite true. In every case there is a struggle for control, and the stock certainly modifies the cion; while the new wood grown from the cion will react somewhat on the original tree. What we expect, however, is to be able to grow a better sort of apple, or other fruit, on a tree the fruit of which is inferior. Or we may not have room for all the varieties that we desire, and so graft several of them into the same tree. One apple tree may in this way bear varieties that ripen from early summer to the latest winter stock.

The most common method of grafting is by placing wedges in clefts. This is sometimes called wedge grafting, and sometimes cleft grafting. The method is very simple, and may be practised by boys and girls of any judgment. Saw off the stock, smoothly, at any desired height, and generally just above a bud. Split this stock straight down the middle, and insert an iron wedge, (which should be a part of your splitting knife) then so insert one or more wedged-shaped cions, that the bark shall cross the bark of the stock. The inserted cion should hold from one to two buds. The knife used in shaping it to a wedge, should cut very smoothly, and especially should not loosen the bark. When these wedges are nicely adjusted, rap out the iron wedge, and place all over the wound a prepared grafting wax. This should come down on the sides, so as to cover the split. No part of the wood should be left exposed to the air. The whole process should be done with neatness and care, leaving no rough wood, whether covered by wax or not.

Inarching is another form of grafting, which is easily practised where two plants stand near each other, and you wish to multiply the one at the expense of the other. Draw over the limb which you

wish to use as cion, cut off the end; and where it touches the other stalk, insert it in a clean cut that will just admit it. Tie the branch firmly in place, until union takes place. Saddle-grafting consists in cutting off the stock like a wedge. The bottom of the cion is then notched, so as to neatly fit over the wedge. It must then be tied, and wax must be applied as in cleft grafting. It is hardly necessary for me to describe other forms of grafting, for skilled orchardists will have already learned these methods of propagation; and amateurs may best confine themselves to the methods I have described.

Budding is done anywhere from the end of June to the end of August; earlier in the South — while grafting is done just before the growth begins in the spring. The bud which you insert must be a dormant leaf bud; and you remove it from its native place with a very sharp knife — inserting the knife half an inch or more below the bud, and drawing it upward, so as to take with the bud a slice of bark, and a very little of the pith of the stem. Now, with the point of your knife, make a horizontal cut where you wish to insert the bud, cutting through the bark to the wood. Across this make a perpendicular cut, about an inch and a half long. With your knife, or a budding tool, raise the edges of the bark until you can slip the bud neatly inside. Press it downward until it sits firm; fold the bark neatly over it; and then tie it in place, either with strips of cloth or bark, Now you will smear this with wax, sufficiently to prevent the bark from drying, and to keep out the rain. Union will take place within two or three weeks; after which the branch may be cut off just above the bud, and the inserted bud will be left to form the new branch. If a bud has failed to adhere, it is still possible to repeat the process the same season. The success of the

operation depends, (1) on smooth cuts, (2) on nicely fitting the bud into the incision, (3) on close tying, so as to exclude the air and water. It is best to do your budding in the evening or on a cool, moist day, to avoid rapid drying. When you are using a large quantity of buds they should be wrapped, as you wrap cions, in a moist cloth.

The most skilled horticulturists describe over one hundred ways of grafting and budding. I have named all that are essential to a home-maker. You will now need to understand the manufacture of what we technically call grafting-wax. This is made after many recipes, that vary largely in materials and proportions. The famous "French mastic," or Leforts's Liquid grafting-wax is made by melting one pound of white resin slowly. When hot add one ounce of beef tallow. When thoroughly melted remove from the fire, and with constant stirring, add slowly one tablespoonful of turpentine and five ounces of common alcohol or of wood alcohol.

A very common wax, and a very good one, is made of two pounds of resin, one and one-fourth pounds of bees-wax and three-fourths of a pound of tallow. After this is well melted together it is best to pull it for a while, in order to perfect the mixture and make it work smooth when applied to the limbs. It should be carried in a pail of quite warm water as you move from tree to tree, and your fingers should be well greased while handling it. Carelessness in applying wax is the cause of many failures in the growth of cions. Smooth it down very carefully with your fingers, until you are sure that no air bubbles are underneath; certainly no drops of water. There should, by no chance, be the least portion of uncovered split or sawed wood. In the above recipe linseed oil may take the place of tallow.

Double-working is a phrase used by nurserymen to describe the following process. Some varieties of apples, pears, and especially of plums are so feeble in growth, that they will not make good trees, if grafted in the ordinary way at the crown of the root. In these cases strong-growing varieties are first grafted into the stock; and higher up the more frail-growing sorts are inserted.

We have come to the end of this delightful study of wonderful ways of making the world richer in the best things. At the same time I have come to the end of my book. It is with the hope that it will be of use to every one who chances to open its pages.

THE END

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